

Vol. VIII

No. 1

M I C R O F I L M
A B S T R A C T S

*A Collection of Abstracts of
Doctoral Dissertations and Monographs
Available in Complete Form
on Microfilm*

UNIVERSITY MICROFILMS
Ann Arbor, 1948

Printed and Lithoprinted in U. S. A.
University Lithoprinters, Ypsilanti, Michigan

1948

INTRODUCTION

In the past this publication has been devoted exclusively to abstracts of doctoral dissertations, available in complete form as microfilm or paper enlargements. Volume VI Number 2 initiated a departure from this policy; the inclusion of abstracts of longer monographs of merit, in addition to dissertations.

The same conditions warranting microfilm publication of dissertations, namely size, expense of publishing through ordinary channels, delay in publication, and a limited but nonetheless important demand for copies, apply equally well to certain monographs of a specialized nature. Accordingly this and future issues will be divided into three sections instead of two, as in the past: 1) Abstracts of doctoral dissertations; 2) Abstracts of monographs (not dissertations); and, 3) A cumulative index of titles abstracted in preceding issues of Microfilm Abstracts.

In the case of dissertations the candidate's committee must approve the thesis as ready for publication, serving somewhat as a screen against poor scholarship and premature publication. Such control cannot be exercised in the case of monographs. This service is limited to accredited and mature scholars, each manuscript is presented and must stand on its own merits without further editing or inspection by University Microfilms.

While many are familiar with the salient points of microfilm publication, there are many more who are not, and for their information the following summary may be of interest.

1. The author submits a carefully typed first copy of the manuscript, ready for publication without corrections.

2. The author also submits an abstract of 700 words or less, accurately describing the contents of the manuscript, as a guide to it, but not as a substitute for it.
3. The manuscript is microfilmed, the negative carefully inspected, and put in vault storage.
4. The manuscript is catalogued by an expert, and this information sent to the Library of Congress, for printing and distribution of cards to depository catalogues and libraries.
5. The abstract is printed in the forthcoming issue of Microfilm Abstracts which is distributed without charge to leading libraries here and abroad, and to a selected list of journals and abstracting services. In this way each title becomes integrated into the bibliographical system of scholarship.
6. The charge for this service is \$15.00 irrespective of the size of the manuscript.
7. Anyone, after consulting the abstract and concluding the complete manuscript would be of value, can obtain a microfilm copy from University Microfilms at 1 $\frac{1}{4}$ ¢ per page.

This method separates the two necessary functions of publishing: notification, or the process of informing prospective users of the existence and contents of a manuscript and distribution, or the furnishing of a copy upon demand. Each of these functions pays its own way, since if no one wishes a copy the investment is small. However, if there is a demand, copies can be produced at current book rates.

Such is the plan back of Microfilm Abstracts. The service is available to any graduate school wishing to work with us on the publication of doctoral dissertations, or to any mature and qualified author of a monograph who wishes to publish in this way. Details will be gladly furnished upon request.

Eugene Power

CONTENTS

PART I--DISSERTATIONS

AGRICULTURAL CHEMISTRY

Page

- THE CHANGES OF ASH AND NITROGEN IN THE
GERMINATING MUNG BEAN 1
Tsing Lai Lau

ANIMAL PATHOLOGY

- STUDIES ON THE ETIOLOGY OF SPECIFIC INFEC-
TIOUS BOVINE PYELONEPHRITIS 3
Ernest Star Feenstra

BACTERIOLOGY

- SEROLOGIC PRETESTING OF LABORATORY ANIMALS
FOR STUDIES WITH HEMOPHILUS PERTUSSIS 5
Paul Fugazzotto
- STUDIES OF THE EFFECTS OF OXYGEN ON MULTIPLICA-
TION AND METABOLISM OF BRUCELLA 7
Ruth Evelyn Sanders

BIOLOGICAL CHEMISTRY

- BLOOD CHLORIDES OF FISHES 10
Dallas K. Meyer

BOTANY

- THE DEVELOPMENT OF HEADBLIGHT OF WHEAT CAUSED
BY GIBBERELLA ZEAE (SCHW.) PETCH AND
HELMINTHOSPORIUM SATIVUM P. K. AND B 13
Axel Langvad Andersen
- ANTISEPTIC CHEMICALS TO INHIBIT THE GROWTH OF
MICROORGANISMS IN NUTRIENT SOLUTION CULTURES
CONTAINING SOLUBLE CARBOHYDRATES 15
Thomas Matthew Eastwood

BOTANY

Page

- TERMINAL ELONGATION OF A NUMBER OF THREE
SPECIES IN RELATION TO CERTAIN ENVIRON-
MENTAL CONDITIONS IN NORTHERN NEW YORK 17

C. Eugene Farnsworth

- ERAGROSTIS IN NORTH AND MIDDLE AMERICA 20

LeRoy Hatfield Harvey

CHEMISTRY

- PREPARATION AND REACTIONS OF CERTAIN
CYCLIC KETONES 22

George Iwao Fujimoto

- THE PRECIPITATION AND DETERMINATION OF
ZIRCONIUM BY HYDROLYSIS OF METAPHOS-
PHORIC ACID AND ORGANIC PHOSPHATES 25

Richard Balser Hahn

- THE FLOTATION OF COPPER SILICATE BY
ALKYL-SUBSTITUTED TRIPHENYL METHANE DYES . . . 27

Randall White Ludt

- MASS TRANSFER IN BEDS OF FLUIDIZED SOLIDS . . 30

William Resnick

- PHASE EQUILIBRIA OF THE METHANE-KENSO¹⁶
SYSTEM TO PRESSURES OF 25,000 POUNDS PER
SQUARE INCH AND TEMPERATURES TO 250°F. . . . 31

Michael Joseph Rzasa

- THE DESIGN, CONSTRUCTION, AND OPERATION
OF A HIGH TEMPERATURE, HIGH PRESSURE PLANT . . 34

Cedomir M. Sliepcevich

ECONOMICS

- ORGANIZATION OF THE LABOR MARKET
UNDER PLANNED ECONOMY. 36

Arunchandra Chhotalal Chhatrapati

- THE THEORY OF INDUSTRIAL DEVELOPMENT
IN ECONOMICALLY UNDEVELOPED COUNTRIES 38

Ying Hsin

EDUCATION

Page

THE RELATIONSHIP OF SCIENCE DEFICIENCIES
TO SUBSEQUENT ACADEMIC PROGRESS IN THE
SCHOOL OF ENGINEERING AT MICHIGAN STATE
COLLEGE OF AGRICULTURE AND APPLIED SCIENCE . . . 40
C. Fred Clarke

A FOLLOW-UP STUDY OF ONE HUNDRED VETERANS
WHO WERE COUNSELED AT THE CITY COLLEGE
VOCATIONAL ADVISEMENT UNIT 43
Margaret E. Condon

THE DEVELOPMENT OF CRITERIA FOR THE
EVALUATION OF CITIZENSHIP TRAINING IN
THE SENIOR HIGH SCHOOLS 46
Theral Thomas Herrick

AN INTRODUCTION TO MUSICAL DEVELOPMENT 49
Walter E. Nallin

GUIDANCE PROBLEMS ENCOUNTERED IN CERTAIN HIGH
SCHOOLS OF MICHIGAN: THEIR TYPES, FREQUENCIES,
AND IMPLICATIONS FOR TEACHER TRAINING 52
Stanley Kirke Norton

MARIA MITCHELL, AS AN EDUCATOR 54
Alice E. A. Priestley

THE PREPARATION OF A COURSE IN SAFETY
EDUCATION FOR TEACHERS OF HEALTH AND
PHYSICAL EDUCATION IN TRAINING 57
Don Cash Seaton

RELATED INFORMATION FOR THE COMPREHENSIVE GEN-
ERAL SHOP IN A FUNCTIONAL JUNIOR HIGH SCHOOL
INDUSTRIAL ARTS PROGRAM IN NEW YORK STATE . . 60
Robert Long Thompson

THE AMERICAN WAR-BLIND AS AIDED
BY THE FEDERAL GOVERNMENT. 63
Jacob Twersky

EDUCATIONAL PSYCHOLOGY

Page

- INTROVERSION AND EXTROVERSION IN THE HIGH
SCHOOL AND THEIR RELATION TO AGE, SEX, ACADEMIC
SUCCESS, AND LEADERSHIP 67
Reginald DeKoven MacNitt

GEOGRAPHY

- THE DANUBE BASIN--PATTERNS IN
POLITICAL GEOGRAPHY 70
George Kiss
- THE SANTA MARIA VALLEY,
SANTA BARBARA COUNTY, CALIFORNIA 72
Clifford Herbert MacFadden

GEOLOGY

- GEOLOGY OF THE SIERRA DE LOS MUERTOS AREA,
COAHUILA, MEXICO, AND APTIAN CEPHALOPODS
FROM THE LA PENA FORMATION 74
William Elliott Humphrey

HISTORY

- THE ENGLISH GAME LAWS WITH PARTICULAR REFERENCE
TO REFORM IN THE NINETEENTH CENTURY . . . 76
Homer Louis Knight

HISTORY, MODERN

- THE NATIONAL CAREER OF BLANCHE KELSO BRUCE . . 79
Sadie Daniel St. Clair
- THE PUBLIC CAREER OF HERBERT SPENCER HADLEY 82
Lloyd Edson Worner, Jr.

LANGUAGE, ENGLISH

- THE ENGLISH QUESTION PATTERNS FROM 1100-1600 . 85
Russell Cospers

LANGUAGE, LATIN

Page

- ADEQUACY OF THE LATIN WORD LIST OF THE COLLEGE ENTRANCE EXAMINATION BOARD AS A MEANS FOR TEACHING WORDS OF LATIN DERIVATION OCCURRING IN THE GENERAL VOCABULARY OF THE ENGLISH LANGUAGE 87
Carolyn Elizabeth Bock

LITERATURE, ENGLISH

- ALTERATIONS OF SHAKESPEARE 1660-1710: AND AN INVESTIGATION OF THE CRITICAL AND DRAMATIC PRINCIPLES AND THEATRICAL CONVENTIONS WHICH PROMPTED THESE REVISIONS 90
Louis M. Eich
- WILLIAM WHITEHEAD: A STUDY OF HIS LIFE, HIS PLACE IN HIS DAY, AND HIS WORKS 92
Frederick Louis Neebe

LITERATURE, GERMAN

- HERMANN STEHR IN THE LIGHT OF LITERARY CRITICISM 1898-1940 95
Harold Stewart Courant

LITERATURE, SPANISH

- SOURCES OF "LA CRISTIADA" 97
Sister Mary Edgar Meyer
- THE DEVELOPMENT OF THE CHRISTMAS PLAY IN SPAIN FROM THE ORIGINS TO LOPE DE VEGA . . . 100
Beatrice P. Patt

MATHEMATICS

- A GENERALIZED CONVOLUTION FOR THE FINITE FOURIER TRANSFORMATION 103
Arvid Werner Jacobson
- CONTRIBUTIONS TO THE STUDY OF THE ASYMPTOTIC DEVELOPMENTS OF ANALYTIC FUNCTIONS 105
Franklin Chapin Smith

MEDICINE

Page

- THE WATER PRECIPITATION TEST AS AN
INDEX OF HEPATOCELLULAR DAMAGE 109
Jean Robertson Clawson

PHYSICS

- LOW FREQUENCY FLUCTUATION
VOLTAGES IN VACUUM TUBES 111
Robert Worthington Bogle

- A STUDY OF THE ELASTIC PROPERTIES
OF VARIOUS SOLIDS BY MEANS OF ULTRA-
SONIC PULSE TECHNIQUES 113
Julian Ross Frederick

- THE EFFECT OF NONLINEARITY AND FREQUENCY
DISTORTION ON THE AMPLITUDE DISTRIBUTION
FOR STATIONARY RANDOM PROCESSES 116
Philip S. Jastram

- AN INVESTIGATION OF METHODS FROM MEAS-
URING ABSORPTION COEFFICIENTS OF GAMMA RAYS . 118
William Charles Parkinson

- THE PROBLEM OF MEASURING THE ENERGY SPECTRUM
OF THE SYNCHROTRON BEAM, AND AN EXPERIMENTAL
INVESTIGATION OF HIGH RESOLUTION COUNTING
TECHNIQUES 120
Robert W. Pidd

PSYCHOLOGY

- THE INTER-RELATIONS OF CONTRAST, AREA,
AND ADAPTATION BRIGHTNESS IN HUMAN BI-
NOULAR VISION 121
H. Richard Blackwell

SOCIOLOGY

- THE HEALTH INSURANCE MOVEMENT IN THE
UNITED STATES; A CASE STUDY OF THE ROLE
OF CONFLICT IN THE DEVELOPMENT AND SO-
LUTION OF A SOCIAL PROBLEM 123
Odin Waldemar Anderson

CONTENTS

xi

SOCIOLOGY

Page

THE FACTORS IN OCCUPATIONAL
SELECTION AMONG DETROIT JEWS 125
S. Joseph Fauman

A COMPARATIVE STUDY OF CERTAIN HOMELESS
AND UNATTACHED DOMICILED MEN 127
Boris M. Levinson

ZOOLOGY

THE DEVELOPMENT OF THE ENTOMOLOGICAL
EXHIBIT IN MUSEUMS OF THE UNITED STATES . . . 130
Lucy W. Clausen

ARBOREAL ADAPTATIONS OF PEROMYSCUS, WITH
SPECIAL REFERENCE TO THE USE OF THE TAIL . . . 133
B. Elizabeth Horner

THE TIME INTERVAL BETWEEN DETERMINATION
AND DIFFERENTIATION OF WINGS AND ASSOCI-
ATED STRUCTURES IN THE APHID MACROSIPHUM
SANBORNII (GILLETTE). 135
James B. Kitzmiller

THE MECHANICS OF ENVIRONMENTAL CONTROL
OF BODY FORM IN FISHES 137
William Robert Martin

DISTRIBUTION AND RELATIONSHIPS OF
THE SNAKES OF THE GENUS LEPTOPHIS 139
James Arthur Oliver

PART II--CUMULATIVE INDEX 141

1871

1871

THE STATE OF NEW YORK

IN SENATE

JANUARY 1, 1871

REPORT OF THE

COMMISSIONERS OF THE LAND OFFICE

FOR THE YEAR 1870

1871

ALBANY: PUBLISHED BY THE

UNIVERSITY OF THE STATE OF NEW YORK

1871

PRINTED BY THE

UNIVERSITY OF THE STATE OF NEW YORK

1871

ALBANY: PUBLISHED BY THE

UNIVERSITY OF THE STATE OF NEW YORK

1871

PRINTED BY THE

UNIVERSITY OF THE STATE OF NEW YORK

1871

ALBANY: PUBLISHED BY THE

UNIVERSITY OF THE STATE OF NEW YORK

1871

PRINTED BY THE

UNIVERSITY OF THE STATE OF NEW YORK

1871

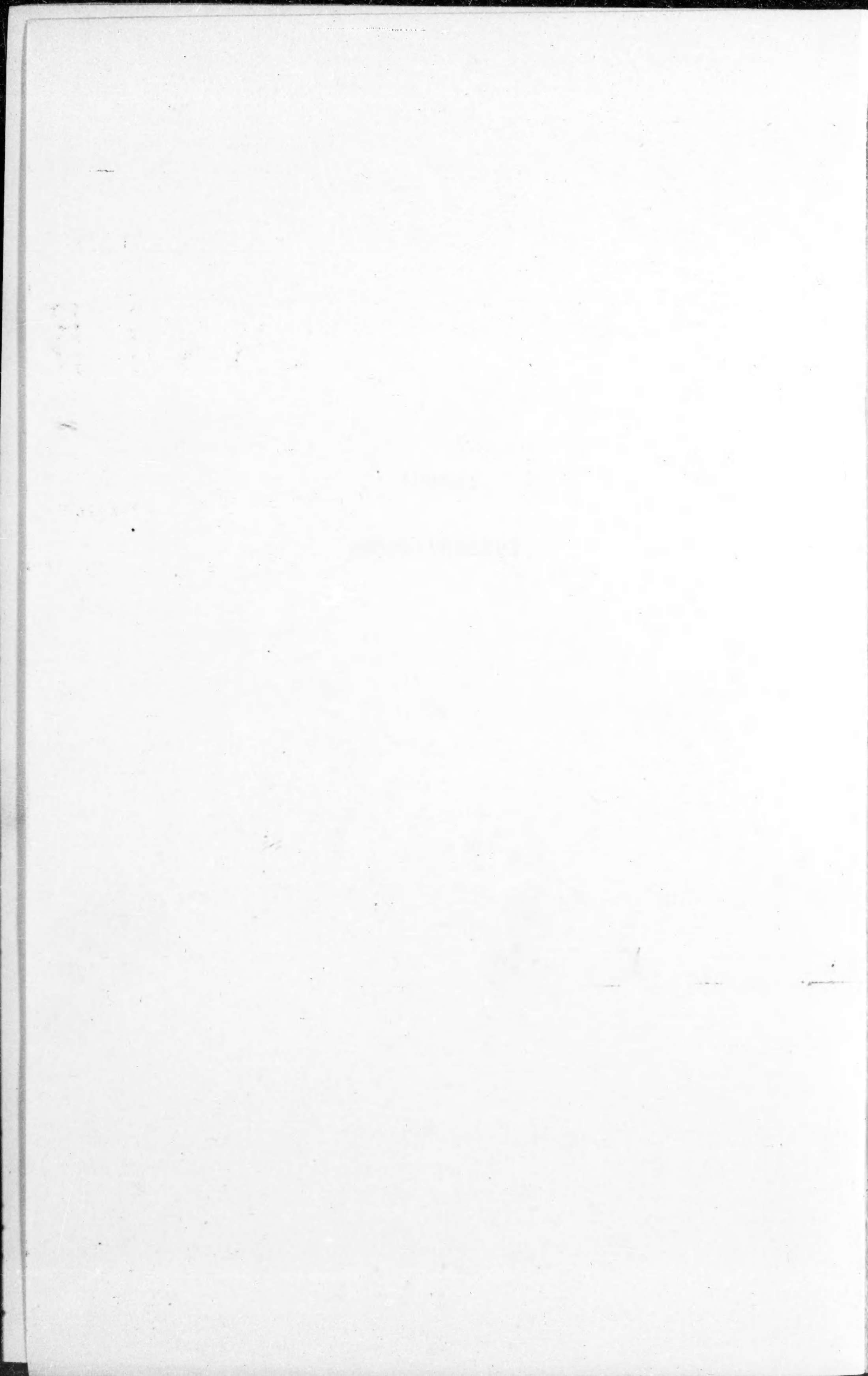
ALBANY: PUBLISHED BY THE

UNIVERSITY OF THE STATE OF NEW YORK

1871

Part I

DISSERTATIONS



AGRICULTURAL CHEMISTRY

THE CHANGES OF ASH AND NITROGEN IN THE GERMINATING MUNG BEAN

Tsing Lai Lau, Thesis (Ph.D.)
University of Missouri, 1936

Mung beans of the green, carbohydrate-rich Chinese variety were sprouted by frequent dousing with water in total darkness, to the point where the yield of sprouts in moist weight was 7.5 to 9 fold the original dry weight of beans. The following changes were observed:-

If sprouting was in tap water, there was an increase of CaO equivalent to 3 times the lime content of the water absorbed, and of MgO equivalent to 2.2 times the magnesia content of the absorbed water. Even after deducting the hulls, these minerals in the sprouts far exceed what was in the original entire beans.

If sprouting was in distilled water, two-thirds of the calcium and 12.6% of the Mg. disappeared. Even in the case of the Mg., this was more than could reasonably be explained by removal of the hulls, hence an active leaching must be postulated. Total ash and alkalinity of the ash underwent similar changes. Phosphorus losses amounted to about 21% to 23% of the original quantity. There was no indication how much of this was leaching of inorganic salts and how much was metabolic.

The beans contained 3.72% nitrogen, equivalent to 23.25% "protein". About 64% of this was reported as water-soluble albumin, coagulable only at 97° or above. 14% appeared as a globulin, coagulating at 61° or below, and 13% as soluble non-protein nitrogenous material. Attempts to purify a globulin fraction, by repeated salting out, brought out another globulin (possibly artefact?) coagulating at 90°C.

During sprouting this nitrogen content underwent radical re-constitution. The original two major protein constituents, a low-temperature coagulating globulin and a high-temperature coagulating albumin fraction, virtually disappeared, and the unextractable fraction fell off to 11.3% from an original 20%. In place of these fractions were found a new albumin, 10%, which was low-temperature coagulable; a new globulin, 7%, coagulable at medium temperature; another new globulin coagulable at high-temperature, 13%; and a very heavy increase of non-coagulable water-soluble nitrogen, which now comprised 53% of all nitrogen.

Despite these profound changes in protein constitution, and also the loss of the hulls, which comprised approximately 11% of the original dry weight, the sprouts had only 4.6% less nitrogen than the original seeds. Their metabolic loss other than hulls, ranged from 12.1% to 18.5% of the dry weight of the seeds. The loss of dry weight must be attributed mostly to expenditure of carbohydrate.

Publication No. 927

Microfilm copy of complete manuscript 99 pages
at 1 1/4 cents, total cost \$1.24, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-57

ANIMAL PATHOLOGY

STUDIES ON THE ETIOLOGY OF SPECIFIC INFECTIOUS BOVINE PYELONEPHRITIS

Ernest Star Feenstra, Thesis (Ph.D.)
Michigan State College, 1947

Part I. Pathogenicity of Corynebacterium renale for Rabbits.

In order to determine the efficacy of the rabbit as an experimental animal for use in the study of bovine pyelonephritis, 22 white rabbits were inoculated intravenously with a suspension of Corynebacterium renale which had been grown on tryptose agar (Difco) at 37°C for 24 hours. These rabbits were necropsied at intervals of one-half hour, one, two, three, four, five, six, seven, nine, eleven, eighteen and nineteen days after inoculation. Hemoglobin determinations, total leukocyte counts and differential leukocyte counts were made on alternate days. The heart blood, lungs, liver, spleen, kidney, sternal bone marrow and urine were cultured on tryptose agar. For microscopic study, specimens of the lung, liver, spleen, kidney, ureters and urinary bladder were fixed in Zenker's fluid; paraffin sections prepared, and stained with hematoxylin and eosin and by the Gram-Weigert method for staining bacteria in sections.

The earliest change in the kidney was the accumulation of pseudoeosinophils in the capillaries and collecting tubules with congestion in the papillary region of the medulla on the second day. Following this, at three and four days after inoculation, necrosis and erosion of the papilla were found. Masses of bacteria were found in the remains of capillaries and tubules and in the debris in the pelvis. The polymorphonuclear leukocyte (pseudoeosinophil) was the predominant inflammatory cell found in the early lesion. On about the fourth day the renal

pelvic mucosa appeared necrotic and the peripelvic tissues contained serous fluid, fibrin, erythrocytes and pseudoeosinophils. Lymphocytes appeared on the sixth day and nononuclear phagocytes and active fibroblasts appeared on the seventh day. These latter three cells increased in number as time passed while the pseudoeosinophils decreased in number but never disappeared entirely. At 17 and 18 days there were changes in the cortex such as an increase in interstitial connective tissue, dilation and constriction of tubules and accumulations of lymphocytes. The blood picture was one characteristic of acute infections and showed changes such as an increase in leukocytes on the fourth day and an increase in percent of pseudoeosinophils with a decrease in percent of lymphocytes in the differential leukocyte count.

Part II. Properties of Some Colonial Phase Variants of Corynebacterium renale.

Five cultures, representing at least three different colony types were chosen from stock cultures of Corynebacterium renale for study in order to determine their morphological, biochemical, serological and pathogenic relationships.

One culture which might be classified as "smooth" showed the weakest action in the fermentation of glucose, digestion of casein, showed the least resistance to the bactericidal action of bovine plasma, and was the least virulent for rabbits.

Two cultures which might be classified as "rough" showed the most resistance to the bactericidal action of bovine plasma and were the most virulent for rabbits.

The other two cultures were intermediate in morphology and pathogenicity.

The results of agglutination tests showed that there were antigenic differences and similarities between the different cultures but there was little or no correlation with the morphological characteristics of the colonies.

BACTERIOLOGY

SEROLOGIC PRETESTING OF LABORATORY ANIMALS FOR STUDIES WITH HEMOPHILUS PERTUSSIS

Paul Fugazzotto, Thesis (Ph.D.)
Michigan State College, 1947

The work leading to this report was begun early in 1939 with the purpose of studying immune responses to Hemophilus pertussis by means of complement fixation. In preliminary studies there were encountered marked inconsistencies, in the behavior of H. pertussis antigens, which prohibited establishment of a standardized complement fixation procedure with any degree of finality. Similar difficulties have also been a common occurrence in the studies of other investigators, and this has resulted in many conflicting reports. The results of the present study, however, cannot fail to play a major role in solving some of the problems involved.

After considerable experimentation it was considered necessary to establish a procedure whereby a complement serum, known to be (H. pertussis) antibody free, could be obtained. Such a procedure was devised and subjected to tests on sera of more than 1000 guinea pigs; and the results show that very high percentage of the guinea pigs tested carried antibodies in their serum. These antibodies are not detectable, in most cases, by other technics; and evidence is given to indicate that their presence in the complement serum is almost entirely responsible for the apparent anticomplementary activity of H. pertussis, and its inconsistent behavior.

The proposed complement selection procedure involved selection of a "preliminary" complement where-with the subsequent selection can be made of the "standard" (antibody-free) complement. By employing the "standard" complement, it is possible to use concentrations of antigens, in complement fixation tests,

far greater than any reported in the literature, resulting in a test of greater sensitivity. Also, concentrations of antigen far in excess of those necessary for maximum sensitivity have no deleterious effect on complement; and the need for daily antigen titration is eliminated. Due to the very rigid conditions of the complement selection procedure, the complement supply is likely to be rather limited, but ample supplies are usually assured by stabilizing the selected complement according to the method given.

Complement fixation tests on sera of "normal" rabbits, sheep and horses showed these animals also have (H. pertussis) antibodies, while "normal" young mice do not. These results corroborate, qualitatively, the reports of other investigators. Quantitatively however, it is possible that the means used by the latter to test their animals have failed to present a complete picture, thereby risking one or more of the conceivable complications which may result from involving (partially) immune animals in pertussis studies. The writer does not intend his data to apply, quantitatively, to the stocks of animals available to other workers, for the level of "immunity" of different stocks is certainly not predictable. It is, however, recommended that the serum of all animals to be involved in studies with H. pertussis be subjected to a pretesting procedure such as the one described in this report. Especially important is the application of this procedure to selection of the guinea pig complement that is to be used in routine complement fixation tests; and this is true not only in tests with H. pertussis antigens, but with other antigens as well.

Publication No. 929

Microfilm copy of complete manuscript 69 pages
at 1 1/4 cents, total cost \$1.00, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilm, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-59

STUDIES OF THE EFFECTS OF OXYGEN ON
MULTIPLICATION AND METABOLISM OF BRUCELLA

Ruth Evelyn Sanders, Thesis (Ph.D.)
Michigan State College, 1947

The emphasis which has been placed on constituents of culture media has overshadowed the importance of certain other factors which influence multiplication and metabolism of microorganisms. Nutritional studies of the Brucella organisms have not solved the problem of production of large numbers of cells in a liquid medium. An investigation of this problem resulted in a study of the effect of atmospheric gases on the growth of Brucella in tryptose peptone liquid media. It has been found that the oxygen demand of these organisms is extremely high and has been a limiting factor in growth in liquid media. Brucella cells have been grown in large numbers in a short period of time, in a simple and practical liquid medium in an atmosphere of pure oxygen.

The media studied contained various concentrations of tryptose, glucose, thiamine hydrochloride and sodium chloride. The effects of various rates of flow of air, oxygen, carbon dioxide and mixtures of these gases on multiplication of Brucella were determined. Each medium was sterilized in a one liter bottle fitted with a two-hole rubber stopper and glass tubing. The rate of flow of each gas into a culture container was measured by means of a "Flowrator". All cultures were grown on a push-pull type of shaker and glass float tubes were placed in the bottles to intensify the movement of the liquid and distribution of gas into the medium. Cultures grown in a normal atmosphere in bottles which were fitted with cotton plugs served as controls.

A continuous supply of oxygen to a culture in an adequate medium had a pronounced stimulatory effect on multiplication. When oxygen was supplied to a culture in a flow of air, the total cell count was not greater than when air was available through a cotton plug. Pure carbon dioxide suppressed growth, but the concentration which exists in air was not inhibitory. Brucella abortus exhibited a tolerance for carbon dioxide much greater than did Brucella suis or Brucella melitensis.

In an oxygen atmosphere maximum total cell counts of each of the species were obtained in a medium containing three per cent tryptose, two per cent glucose, 0.5 mg. per cent thiamine and 0.5 per cent sodium chloride.

When an ample supply of glucose was available, the organisms decomposed 18 to 21 mgs./ml. when grown in an atmosphere of pure oxygen. The amount of glucose decomposed per unit number of cells was less for Br. suis than for the other two species.

In an attempt to determine the direction of the breakdown of glucose, quantitative determinations were made of pyruvic acid, lactic acid and carbon dioxide. The effect of thiamine on the amount of glucose decomposed and the role of thiamine in the utilization of pyruvic acid were studied. Glucose was replaced by pyruvate and lactate to determine if the organisms could utilize these substrates. Measurements of ammonia in the cultures was employed as a rough estimate of peptone decomposition.

The metabolism of glucose by Brucella when grown in an atmosphere of pure oxygen is a rapid and complete oxidation of the carbohydrate. Carbon dioxide is the major end-product. Addition of thiamine was not required for decomposition of glucose, although, when thiamine was present, the rate of decomposition of glucose was accelerated. In the absence of thiamine, however, only minute amounts of pyruvic acid were detected in the culture media. There was no evidence of the formation of lactic acid or acetic acid from glucose.

The accumulation of ammonia from decomposition of nitrogenous substances in media without glucose resulted in a rise in pH to 8.0 to 8.6. In media containing glucose peptone decomposition in cultures of Br. suis proceeded at a significantly higher rate than in cultures of Br. abortus and Br. melitensis in which there was a marked preferential breakdown of glucose.

Publication No. 932

Microfilm copy of complete manuscript 33 pages
at 1 1/4 cents, total cost \$1.00, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-62

BIOLOGICAL CHEMISTRY

BLOOD CHLORIDES OF FISHES

Dallas K. Meyer, Thesis (Ph.D.)
University of Missouri, 1947

The major role of sodium chloride in regulating the internal osmotic balance between the circulating fluid and the body tissues in vertebrates is well established. Mammals, birds and reptiles obtain the sodium chloride and water required for these regulations through the gastro-intestinal tract. Fishes, however, can and do absorb both the sodium and chloride ions directly from the surrounding water through the gills into the blood. The blood chlorides of fishes and the mechanisms of their regulation were investigated by studies conducted in both the field and laboratory.

The chloride values found in 191 determinations on the whole blood and 145 determinations on the serum of freshwater fishes representing 13 species (Salmo irideus, Salmo trutta fario, Salvelinus fontinalis, Oncorhynchus kisutch, Prosopium williamsoni, Ictalurus punctatus, Ameiurus erebennus, Catostomus sp., Carpionodes velifer, Cyprinus carpio, Mylocheilus lateralis, Ptychocheilus oregonensis, and Stizostedion vitreum) are reported. These chlorides in wild and hatchery-held fishes ranged from 62 to 456 mgs. per cent for whole blood and from 114 to 592 mgs. per cent for serum. The mean values for whole blood were between 150 and 400 mgs. per cent and for serum between 239 and 520 mgs. per cent. Species differences in the range of blood chlorides were demonstrated. Midsummer observations revealed no significant differences in blood chlorides between the sexes in channel catfish and brook trout. Significant differences in blood chlorides were found between populations of the same species from different geographical localities. Factors which might

account for variations as food, water, or inherent physiological characteristics are discussed.

The blood chlorides of certain fishes were reduced by changes in the physiological state of the fish induced by confinement in unfamiliar situations, prolonged stimulation and excitation.

Undisturbed fishes were able to maintain their normal blood chloride levels when living in waters carrying from 0.3 to 45 p.p.m. of chlorides. Within the limits of chlorides usually found in natural freshwaters there was little correlation, if any, between the chloride content of the water and the level of the blood chlorides.

Laboratory studies upon the common goldfish, Carassius auratus, demonstrated that they were able to reduce the chloride content of the water in which they were living to the low level of 0.006 mM. when confined in a rubber sack which separated the water bathing their gills from the urinary and fecal wastes. When the fish were first confined in the sacks there was a loss of chlorides to the extrenal medium but sometime within the first 11 hours chloride absorption was initiated and continued for at least the next 60 hours. The rate of chloride absorption was greatly decreased when the temperature of the water was reduced from 19° C. to 9° C.

Neither the rate of chloride absorption, nor the level of the blood chlorides of the goldfish were significantly altered by exposure to waters carrying 5 p.p.m. of atropine, 50 p.p.m. of pilocarpine, or 15 p.p.m. of physostigmine. From these observations it appears that the parasympathetic nerves have little, if any, control over the movement of the chloride ions through the gills.

The level of blood chlorides and the rate of chloride absorption were not affected by injury to the integument due to the removal of 40 scales from the side of each goldfish.

It was demonstrated both through the ingestion of powdered carmine and by weight changes that the goldfish will swallow water when subjected to rough handling.

The blood chlorides of the goldfish were not markedly altered from their normal values (292.6 mgs. per cent for whole blood and 440.4 mgs. per cent for serum mean values) by exposure to high concentrations of sodium chloride until a level of 100 mM. was exceeded. The chlorides of the blood were significantly elevated at the higher concentrations. Magnesium sulfate solutions as concentrated as 280 mM. produced a slight reduction in blood chlorides.

It was concluded that osmotic regulation in freshwater fishes is directed at maintaining a high blood chloride level when the fish is living in a dilute medium. The effect of high external salinities is determined, to a large extent, by the nature of the ions present. The rise of blood chlorides when the fish is in strong solutions of sodium chlorides is not a protective adjustment to the external environment but reflects the break down of the osmotic regulating mechanisms.

Publication No. 926

Microfilm copy of complete manuscript 192 pages
at 1 1/4 cents, total cost \$2.40, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-56

BOTANY

THE DEVELOPMENT OF HEADBLIGHT OF WHEAT CAUSED BY GIBBERELLA ZEAE (SCHW.) PETCH AND HELMINTHOSPORIUM SATIVUM P. K. AND B

Axel Langvad Andersen, Thesis (Ph.D.)
Michigan State College, 1947

The effects of temperature on growth, sporulation, and spore germination of Gibberella zeae and Helminthosporium sativum; the behavior of the two pathogens when combined in culture; the effects of the quantity of conidial inoculum, stage of host maturity; and the reaction of the host to inoculation with mixed suspensions of the conidia of both pathogens were studied.

Both pathogens showed a very wide temperature range for growth and spore germination; the most rapid radial growth of their mycelia and elongation of their germ tubes took place at 28° C. H. sativum showed some growth at 36° C., a temperature unfavorable for the growth of G. zeae.

H. sativum produced no conidia below 16° and above 28° C. whereas G. zeae produced a few below 16° C. and a maximum number at 32° C. Conidia were produced on infected heads of wheat plants from 15-30° C., with the largest number produced at 25° C. by both pathogens. G. zeae produced conidia more rapidly and in larger numbers than H. sativum.

Disease severity increased with an increase in the amount of inoculum up to 1.0-2.0 million conidia per lot of 10 wheat plants when the conidia were applied in aqueous suspension.

Generally, no infection occurred on wheat heads prior to flowering. Host susceptibility to infection and disease development increased from the flowering stage to the past flowering stage of development.

The most favorable temperatures for infection were 25-30° C. H. sativum was about equally pathogenic in this range whereas G. zeae was definitely more pathogenic at 25° C.

The period of continued wetness (the presence of free moisture on the plants) required for maximum infection and disease development varied with the stage of plant development and the air temperature at the time of exposure. It was the shortest at the optimum temperature and on plants in the later stages of development. Each pathogen exhibited "critical exposure periods" for infection and headblight development. These periods were generally the same for G. zeae but different for H. sativum.

The length of the incubation periods varies with the air temperature and moisture conditions. Those plants exposed the longest to continued wetness at the optimum temperatures for infection and disease development had the shortest incubation periods.

A short period of exposure to continued wetness after inoculation followed by a dry and a second wet period, reduced the amount and severity of infection by both pathogens.

In general, the presence of mycelium or fairly heavy concentrations of conidia of G. zeae retarded the growth of the mycelium and the germination of the conidia of H. sativum. The presence on plants of high concentrations of conidia of one pathogen with a low concentration of the other pathogen resulted in a suppression of the latter. When a mixture of high concentrations of conidia of both species were applied to plants, there was a significant decrease in the percentage of seeds infected by either pathogen as compared to the percentage infected when the same concentration of conidia of either pathogen was applied alone.

Publication No. 919

Microfilm copy of complete manuscript 125 pages
at 1 1/4 cents, total cost \$1.56, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-49

ANTISEPTIC CHEMICALS TO INHIBIT THE GROWTH OF
MICROORGANISMS IN NUTRIENT SOLUTION CULTURES
CONTAINING SOLUBLE CARBOHYDRATES

Thomas Matthew Eastwood, Thesis (Ph.D.)
Purdue University, 1948

Certain antiseptic chemicals were investigated in an endeavor to develop a non-sterile technic to supply soluble organic carbon compounds to higher green plants in nutrient solution cultures. First, the bacteriostatic and fungistatic concentrations of 140 antiseptics were determined in an inorganic nutrient solution containing 0.25 percent glucose. A composite mixture containing these microorganisms capable of growing in this type of culture was used as the inoculant for the test cultures. These test cultures were incubated at 30°C for six days.

Secondly, phytotoxicity data of the inhibitory concentrations of these antiseptic chemicals were obtained with either the red kidney bean or the tomato plant in greenhouse cultures. Silica and cultures, the surface irrigation technic, were employed. No single antiseptic material was found adaptable for this purpose because each one was too phytocidal.

Antiseptic action was greatly increased and phytotoxicity was materially reduced by combining various bacteriostatic agents with fungistatic ones. Although glucose decomposition was prevented in laboratory flask cultures by the use of these combinations, only a partial inhibition of microorganism activity was effected in three types of plant cultures; namely, sand, gravel, and water cultures.

Similar results were secured with "insoluble" and "volatile" antiseptic materials, but these compounds also were too phytocidal. The use of fungistatic chemicals in the nutrient solutions maintained

at about pH 4.0 did not effect reliable inhibition of microorganism activity.

The factors appeared to be responsible for the lack of control of the decomposition of the glucose in the plant cultures. First, at least for the sand cultures, a physical adsorption of some of the antiseptic chemicals upon the silica sand particles was indicated. Secondly, the presence of organic matter in all the cultures, at least active tomato roots, was probably a major factor. The plant roots were not sterile; thus they supplied a large inoculant of those microorganisms capable of decomposing dilute glucose solutions. Plant injury, especially to roots, was experienced because of the glucose decomposition caused by the microorganism activity.

It is postulated that the non-sterile technic may appear feasible if sterile seedlings and media are prepared prior to the start of the subsequent experiments in which glucose is added to the nutrient solutions which contain inhibitory concentrations of suitable antiseptic chemicals.

Additional data are presented which show practical uses of some of the antiseptic chemicals in other horticultural fields. An improved method of seed sterilization was developed, using acidulated chlorine solutions. Fungistatic and fungicidal data were obtained for some of these antiseptic chemicals against three species of fungi which cause damping-off of plants. Suitable materials were found to sterilize the gravel media in both experimental and commercial nutriculture installations. The chlorinated phenols were useful in this application. Likewise the penta chlorinated compound of this series of chemicals was found to be serviceable for wood preservation in greenhouse equipment.

Publication No. 946

Microfilm copy of complete manuscript 139 pages
at 1 1/4 cents, total cost \$1.74, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-76

TERMINAL ELONGATION OF A NUMBER OF TREE SPECIES
IN RELATION TO CERTAIN ENVIRONMENTAL CONDITIONS
IN NORTHERN NEW YORK

C. Eugene Farnsworth, Thesis (Ph.D.)
University of Michigan, 1945

The reaction of trees to the variations in intensity of the physical site factors during the growing season is in considerable degree expressed by the short period trends of the rate of terminal elongation. This is a study of the relation between the rate of terminal elongation of a number of species of forest trees and the site factors: air temperature and solar radiation. The data were obtained during the 1940 and 1942 growing seasons on the Ranger School Forest of the New York State College of Forestry, located in St. Lawrence County of northern New York. Observations of the physical site factor intensities were made on plots occupied by a number of tree species of convenient size for the measurement of terminal elongation. Maximum and minimum air temperatures; soil temperatures at one inch, six inches; and evaporation from black and white atmometer bulbs were recorded daily. The daily difference between the evaporation from the black and white atmometer bulbs was considered to be a measure of solar radiation. Soil moisture was measured at frequent intervals using the electrical resistance method of Bouyoucos and Mick, and did not reach the point of wilting coefficient during the two growing seasons of the study.

The terminal elongation data were arranged to express the daily percent of the total seasonal elongation, and the daily average for each successive five days was calculated from the daily percent of seasonal elongation, daily mean temperature, and daily solar radiation values. Daily values and

average daily values for each successive five days were arranged to provide graphic comparisons of terminal elongation, mean air temperature, soil temperature at six inches, solar radiation, and evaporation from the white atmometer bulb for each species studied. For 1940, data are presented for the following species: Scotch pine (Pinus sylvestris L.), red pine (Pinus resinosa Ait.), Norway spruce (Picea excelsa Link.) (two plots), red maple (Acer rubrum L.) (two plots), sugar maple (Acer saccharum Marsh.) (two plots), and black cherry (Prunus serotina Ehrh.) (two plots); and for 1942: Scotch pine (two plots), Norway spruce, eastern white pine (Pinus strobus L.) Austrian pine (Pinus nigra Arnold), and red maple (two plots). All of the conifers were planted, and the hardwoods were sprouts. Whenever possible at least twenty-five trees of each species were selected for measurement on each plot. In every comparison, similarity of periodicity was shown between the curve of terminal elongation and the curves of the physical site factors.

Smooth curves of seasonal trend were plotted from the daily averages for each successive five days for terminal elongation, mean air temperature, and solar radiation. Deviations of these factors from seasonal trend were expressed as percentages of their respective seasonal trend curve values for each day during the period required for the trees measured to progress from 5% to 95% of the seasonal total elongation for each species. Forty degrees were subtracted from the seasonal trend curve values and the average daily values of mean air temperature, before expressing the deviations from seasonal trend as percentages. Comparisons of the curves of deviations from seasonal trend for mean air temperature, radiation, and elongation of each species on each plot were made graphically and mathematically on the assumption that, if the periodicity of the terminal elongation tends to be controlled by the periodicity of the other two factors, the curves of deviation from seasonal trend tend to rise above or fall below the 100% value simultaneously.

Statistically "very significant" results were obtained from multiple correlations of terminal elongation, mean air temperature, and solar radiation deviations from seasonal trend during both seasons and for each species subjected to analysis. Mean air temperature appeared to be much more important than solar radiation in tending to control the variations in the rate of terminal elongation. Solar radiation was probably of importance chiefly through its direct heating effect. Much higher correlations were obtained with the analysis of the data from the 1942 growing season than that obtained in 1940, apparently because the 1940 seasonal trend curves departed considerably from "average form": the effect of periods of relatively low temperature in May and June.

The forms of the terminal elongation curves expressed as percentages of total seasonal elongation were very similar for two samples of the same species growing on plots experiencing similar physical site factor intensities; and quite different for two samples of the same species growing on plots experiencing dissimilar physical site factor intensities, regardless of the absolute amount of elongation. Considerable data are presented concerning the length of the growing season of the various species on the different plots, and also on the number of days required for the measured trees to elongate the most rapid 50% of the seasonal total.

Publication No. 921

Microfilm copy of complete manuscript 240 pages
at 1 1/4 cents, total cost \$3.00, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-51

ERAGROSTIS IN NORTH AND MIDDLE AMERICA

LeRoy Hatfield Harvey, Thesis (Ph.D.)
University of Michigan, 1948

This revision of the North and Middle American species of *Eragrostis* is based on conventional morphological and geographical criteria. It was felt that an experimental cytogenetical approach would be essential for elucidating the relationships and origin of intergrading forms between the species as recognized and the minor definable entities within the species. The treatment therefore goes only to species, which in the writer's conception are groups of biotypes which, in some instances, pending experimental study, are arbitrarily placed in the larger "species" without experimental proof that they are correctly placed.

Maps showing the geographic distribution of the species indicate that all do not fall reasonably within the limits of recognized named phytogeographic areas. The nearest that can be done to define actual floristic areas for large groups of species requires the recognition of four regions of concentration. These are: (1) The Atlantic and Gulf Coastal Plain of the United States, with the Yucatan Peninsula, the Greater Antilles, and the Bahamas (20 species); (2) the Mexican Plateau and its extension northward into Arizona, New Mexico and Texas and southward into Central America (19 species); (3) the United States to the westward and northward of the Atlantic and Gulf Coastal Plain, including New England, the Great Lakes area and the Mississippi River drainage basin as far west at the 100th Meridian (7 species); and (4) Kansas, Oklahoma and Texas with a tongue extending southward into San Luis Potosí, Mexico (5 species).

A new grouping of species results in the recognition of four sections and ten subsections which probably express in the main true phylogenetic relationships. From an ecological standpoint the groups do not seem to be characteristic of easily defined habitats, which is true of the genus as a whole, but certain species have habitat restrictions or preferences, as, for instance, E. obtusiflora, and E. prolifera, which are halophytes or confined to the general vicinity of the sea coast, E. obtusiflora, which is characteristic of alkali flats, and E. reptans and E. hypnoides which are plants of muddy flats, banks, and drained ditches.

Especial care has been taken in the construction of the keys, which are believed to be workable by general botanists and specialists in grazing plants. The keys are based upon more features of the species than is usual, and provision is made (by double insertions) for making a correct determination even if (on account of variation) the anticipated choice is not made at one of the dichotomies.

The logical disposition of all available material has required the description of five new species, namely, E. perplexa from the Great Plains of the United States; E. oreophila from the mountains of Mexico; E. glandulosa from Guerrero, Mexico; E. yucatana from the Yucatan Peninsula; and E. praetermissa from Guatemala.

Publication No. 967

Microfilm copy of complete manuscript 304 pages
at 1 1/4 cents, total cost \$3.80, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-97

CHEMISTRY

PREPARATION AND REACTIONS OF CERTAIN CYCLIC KETONES

George Iwao Fujimoto, Thesis (Ph.D.)
University of Michigan, 1948

This thesis is primarily one of exploratory investigations into the chemistry of 2-arylcyclohexanones and of derivatives of 1-oxo-1,2,3,4-tetrahydrophenanthrene. A study has been made of reactions and methods of preparation of compounds which may prove useful in the synthesis of resin acids and sex hormones.

Intermediates in the synthesis of dehydroabietic and podocarpic acids have been studied. The preparation of 2-p-isopropylphenylcyclohexanone (50% yield) from 2-chlorocyclohexanone and p-isopropylphenylmagnesium bromide and of 2-m-anisylcyclohexanone (49% yield) from 2-chlorocyclohexanone and m-anisylmagnesium bromide are described.

Because 2-aryl-6-carbomethoxycyclohexanones could not be prepared by the usual method of glyoxalation of 2-arylcyclohexanones and decarbonylation, the preparation of 2-phenyl-6-carbomethoxycyclohexanone by the sodamide condensation of benzyl cyanide and ethyl 5-iodovalerate followed by hydrolysis, esterification and Dieckmann cyclization is described. The structure of the product was proved by hydrolysis and decarboxylation to 2-phenylcyclohexanone.

The reactions of 2-p-isopropylphenylcyclohexanone studied were: glyoxalation, which yielded a lactone; preparation of the dimethylaminomethyl derivative by the Mannich reaction; diethylaminoethylation through the sodamide condensation; and methylation to 2-methyl-2-p-isopropylphenylcyclohexanone and the glyoxalation of this last compound to methyl 2-p-isopropyl-phenylcyclohexanone-6-glyoxalate.

Because difficulties arose in the addition of two and three carbon acid chains to hindered ketones, several methods for accomplishing these additions were investigated. Instead of the expected carbomethoxyethynyl carbinol there was obtained upon treatment of 1-oxo-1,2,3,4-tetrahydrophenanthrene with methyl propiolate in the presence of sodamide the Michael reaction product, 2-carbomethoxyvinyl-1-oxo-1,2,3,4-tetrahydrophenanthrene. This product was reduced and hydrolysed to 2-carboxyethyl-1-oxo-1,2,3,4-tetrahydrophenanthrene. This reaction offers interesting possibilities for constructing rings present in steroids.

The malonic ester condensation was investigated as a method for the addition of the acetic acid chain to a ketone. The condensation of sodio malonic ester with 2-methyl-2-carbomethoxy-1-bromo-1,2,3,4-tetrahydrophenanthrene in alcoholic solution yielded the Williamson ether synthesis product, 2-methyl-2-carbomethoxy-1-ethoxy-1,2,3,4-tetrahydrophenanthrene. Both the ethyl and methyl ethers were prepared by the direct treatment of the bromo ester with alcoholic sodium ethylate and methanolic sodium methylate respectively. The malonic ester condensation in the absence of alcohol solvent did yield the desired malonate derivative which on hydrolysis and decarboxylation gave 2-methyl-2-carbomethoxy-1,2,3,4-tetrahydrophenanthrene-1-acetic acid.

The reactions of the ester of α -oxalyl- γ -1-naphthylbutyric acid (prepared by glyoxalation of ethyl γ -1-naphthylbutyrate) were studied. Cyclization to 3,4-dihydrophenanthrene-1,2-dicarboxylic acid anhydride was followed by hydrolysis and reduction with 2% sodium amalgam to yield only the cis 1,2,3,4-tetrahydrophenanthrene-1,2-dicarboxylic acid. In another reaction methylation of the potassio oxalyl ester with methyl iodide and drastic alkaline hydrolysis yielded 2-methyl-1-oxo-1,2,3,4-tetrahydrophenanthrene (13%). Hydrolysis of the oxalyl ester in 30% sulfuric acid resulted in

decarboxylation and cyclization to 3,4-dihydro-1-phenanthroic acid. By treatment of this acid with an excess of diazomethane there was obtained a pyrazoline derivative which lost nitrogen upon heating to give a compound whose analysis agreed with the structures 1-carbomethoxy-3,4-dihydrophenanthrene or 1-carbomethoxy-1,2-methylene-1,2,3,4-tetrahydrophenanthrene.

Publication No. 952

Microfilm copy of complete manuscript 80 pages
at 1 1/4 cents, total cost \$1.00, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-82

THE PRECIPITATION AND DETERMINATION OF ZIRCONIUM BY HYDROLYSIS OF METAPHOSPHORIC ACID AND ORGANIC PHOSPHATES

Richard Balser Hahn, Thesis (Ph.D.)
University of Michigan, 1948

When zirconyl phosphate, $\text{ZrO}(\text{H}_2\text{PO}_4)_2$, is precipitated from acid solutions by the addition of a soluble orthophosphate, a very gelatinous precipitate is obtained. This precipitate is difficult to filter and wash and it decrepitates badly when ignited. This method can be used only for the determination of small amounts of zirconium (0.5 to 20 mg of ZrO_2).

Attempts were made to improve the nature of the zirconyl phosphate by slow precipitation in homogeneous solution. This was accomplished by hydrolysis of metaphosphoric acid, triethyl phosphate, trimethyl phosphate, and tetraethyl pyrophosphate.

It was found that a soluble complex was formed when an excess of metaphosphoric acid was added to acid solutions containing zirconyl ions. When these solutions were allowed to stand at room temperature the metaphosphate ion slowly hydrolyzed and a granular precipitate of zirconyl phosphate, $\text{ZrO}(\text{H}_2\text{PO}_4)_2$, was formed. Precipitations with metaphosphoric acid were made in various acid solutions, but best results were obtained in 3.6 N sulfuric acid solution. Quantitative determinations of zirconium were made on samples containing from 0.2 to 200 mg of zirconium oxide. Satisfactory separations were obtained from large amounts of aluminum, antimony, arsenate, borate, bismuth, cadmium, chromic, cerous, cobalt, cupric, magnesium, manganese, mercuric, nickel, potassium, sodium, vanadyl, yttrium, and zinc ions. Successful separations were also made from small amounts of calcium, ferric, thorium,

titanium, and uranyl ions. Stannic ions interfered.

Triethyl phosphate and trimethyl phosphate gave dense, crystalline precipitates of the corresponding alkyl phosphates, $\text{ZrO}[\text{H}(\text{C}_2\text{H}_5)\text{PO}_4]_2$ and $\text{ZrO}[\text{H}(\text{CH}_3)\text{PO}_4]_2$, when heated for several hours in acid solutions containing zirconyl ions. It was found that twenty to thirty hours of heating were required for quantitative precipitation with triethyl phosphate. Since equally good results were obtained in half this time with the other reagents, no further studies were made of triethyl phosphates.

Although quantitative precipitations of zirconium were obtained by the hydrolysis of tetraethyl pyrophosphate, this reagent also precipitated ferric ions. Since this ion is usually associated with zirconium, no further studies were made with this reagent.

Trimethyl phosphate gave the best results of the three organic phosphates. Quantitative determinations of zirconium were obtained in samples containing from 2 to 50 mg of zirconium oxide. Best results were obtained when precipitations were made in 3.6 N hydrochloric or sulfuric acid and the precipitates ignited to the pyrophosphate, ZrP_2O_7 . Successful separations were made from large amounts of aluminum, arsenate, bismuth, borate, cadmium, calcium, chromic, cobalt, cupric, magnesium, manganese, mercuric, nickel, potassium, sodium, vanadyl, and zinc ions; and small amounts of ferric, thorium, titanium, and uranyl ions. Antimony, bismuth, ceric, cerous, and stannic ions interfered.

The usefulness of each of the reagents was checked by using it to determine the zirconium in a zirkite ore. The results were compared with those obtained by the standard cupferron method. Metaphosphoric acid gave excellent checks, those of trimethyl phosphate were erratic and the poorest results were obtained with tetraethyl pyrophosphate.

Publication No. 964

Microfilm copy of complete manuscript 95 pages
at 1 1/4 cents, total cost \$1.19, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-94

THE FLOTATION OF COPPER SILICATE BY ALKYL-SUBSTITUTED TRIPHENYL METHANE DYES

Randall White Ludt, Thesis (Ph.D.)
Michigan State College, 1947

Certain alkyl-substituted triphenyl methane dyes are shown to act as collectors in the flotation of chrysocolla, a hydrated, partly colloidal, copper silicate mineral. Colloidal minerals have the property (1) of combining selectively with basic dyes of the triphenyl methane type. The attraction of crystalline minerals for these dyes is much less. This affords the basis by which chrysocolla can be separated from a quartz gangue.

Two types of substituted dyes are synthesized and used, namely: an alkyl-substituted malachite green type; and an alkyl-substituted rosaniline type.

The exact chemical structure of these dyes is considered secondary in importance to their property of causing the flotation of chrysocolla. Their structure is assumed on the basis of their properties as dyes, their method of preparation, and the intermediates used.

The malachite green type includes a homologous alkyl-benzenes (2), (3) through the formation of a p-alkyl-phenyl-aldehyde (4). The aldehyde is then reacted with dimethyl aniline in a reaction, typical to the formation of the ordinary malachite green dye (5).

The dye called octyl-roosaniline is the only one of its type used. With octyl benzene as a reactant, o-nitro-octyl benzene (6) is formed and reduced to the amine (7). Aniline is then reacted with o-octyl aniline, in a typical dye-forming process, to form octyl-roosaniline (8).

The alkyl-substituted dyes are used as collectors in tests on a 100-gram flotation cell. A synthetic mixture of 1 gram of chrysocolla and 99 grams of gangue are considered as standard for the tests. It contains .235 percent copper. Pine oil is used as a frothing agent.

Results show that octyl-malachite green has possibilities for use as a commercial flotation agent. On a single flotation, a 64 percent recovery of copper is obtained when the assay in copper of the concentrate is increased eight to nine times. Either the percent recovery, or the assay of the concentrate can be increased, but at the expense of the other. The most successful tests are carried out at a pH of about 8, with a silica gangue. They show that the flotation is possible. Because of clay mixed with the carbonate gangue, satisfactory separation can not be made from these materials. Tests on the other substituted dyes are less favorable than those on octyl malachite green.

Optimum conditions for the process are not determined. Satisfactory flotation takes place between rather narrow limits and is influenced by many factors. This investigation, by certain tests, does point out the need for further investigation. Among these important factors are the need of suitable depressants for not only colloidal minerals, such as clay, but also carbonate minerals and quartz; pH regulation with alkaline materials; the rate of addition of the collector; a further increase in the length of the substituted alkyl chain; and increase in the assay of the feed material.

BIBLIOGRAPHY

- (1) Dittler, Von E., Z. Chem. Ind. Kolloide, 5, 93.
- (2) Thomas, C.A., "Anhydrous Aluminum Chloride in Organic Chemistry" Chapt. 6, New York (1941) p. 204.

- (3) Martin, E.L., "Organic Reactions" Vol. 1, Adams, R., ed., New York, John Wiley & Sons (1942) p. 167.
- (4) Bouveault, L., Bull. soc. chim., 15, 1017 (1896), 17, 363 (1897).
- (5) Cain, J.C. and Thorpe, J.F., "The Synthetic Dye-stuffs and Intermediate Products" London, C. Griffin (1920) p. 270.
- (6) Rinkes, I.J., Rec. Trav. chim., 63, 3, 53 (1944).
- (7) West, R., J. Chem. Soc., 127, 494 (1925).
- (8) Cain, J.C. and Thorpe, J.F., *ibid.* p. 271.

Publication No. 918

Microfilm copy of complete manuscript 102 pages
at 1 1/4 cents, total cost \$1.28, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-48

MASS TRANSFER IN BEDS OF FLUIDIZED SOLIDS

William Resnick, Thesis (Ph.D.)
University of Michigan, 1948

The rates at which naphthalene was vaporized into air, hydrogen and carbon dioxide from "fixed" and "fluidized" beds have been measured. The beds were composed of various closely sized fractions of granular naphthalene particles ranging in size from 14 to 65 Tyler screen mesh. The experimental work was conducted at 77°F and approximately 1 atm. pressure at gas mass velocities ranging from 10 to 1200 pounds per square foot per hour.

The experimental results were correlated in general form by relating the following dimensionless groups: modified Reynolds number, $\frac{D_p G}{\mu}$, Schmidt number, $\frac{\mu}{\rho D_v}$, $\frac{k_g P M_m}{G}$, and $\frac{D_p \rho_g g (\rho_s - \rho_g)}{\mu^2}$. It was demonstrated that wall effect and bed height were unimportant in the correlated results so that the correlations presented should be of general application. There is evidence to show that size distribution is an important factor in the "fixed" bed data.

Publication No. 956

Microfilm copy of complete manuscript 111 pages
at 1 1/4 cents, total cost \$1.39, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-86

PHASE EQUILIBRIA OF THE METHANE-KENSOL 16
SYSTEM TO PRESSURES OF 25,000 POUNDS PER
SQUARE INCH AND TEMPERATURES TO 250°F.

Michael Joseph Rzasa, Thesis (Ph.D.)
University of Michigan, 1948 .

A knowledge of the physical behavior of hydrocarbons under varying conditions of temperature and pressure is fundamental to a thorough treatment of nearly all operations involved in the recovery, transportation, and refining of petroleum. The operations may involve the applications of densities of the fluid phases, compressibilities of the mixtures, relative amounts of liquid and vapor, and the different relationships which may exist between the properties under varying conditions of temperature and pressure.

With the recent discovery and exploitation of gas and oil wells with reservoir pressures up to 10,000 pounds per square inch, the necessity of extending our knowledge of the behavior of fluids under high pressures is becoming more urgent.

The highest two-phase pressures encountered to date in the study of binary hydrocarbon systems was about 5,300 pounds per square inch. Although two-phase pressures up to 10,000 pounds per square inch have been studied in connection with complex hydrocarbon systems, in no case have pressures above that point been utilized to further our knowledge of the phase behavior of fluids under pressure.

The present research was instigated in order to extend the study of phase equilibria to pressures of 25,000 pounds per square inch and temperatures to 250°F. The methane-Kensol 16 system was chosen in order to investigate the effects of wide volatility of the various components on the relationships existing between the physical properties. Kensol 16 is

a commercial narrow-boiling-range oil of high molecular weight, which could be obtained in quantities sufficient for an investigation of the present type.

A number of items have been accomplished in the present research:

1. Equipment was designed, built, and operated, which permitted the study of phase equilibria to pressures of 25,000 pounds per square inch and temperatures to 250°F. An important feature was the design and successful incorporation of leakproof windows which allowed visual observations of phase phenomena under the above conditions.

2. Liquid densities of the pure Kensol 16 and fluid densities of twelve mixtures of methane and Kensol 16 were experimentally determined under the above conditions.

3. Compressibility factors of twelve mixtures of methane and Kensol 16 were determined, extending our knowledge of these factors from 10,000 pounds per square inch to 25,000 pounds per square inch.

4. Critical data of the methane-Kensol 16 system were determined between 60°F. and 250°F., and the remainder of the critical locus of the system estimated.

5. Equilibrium volatility constants for methane and Kensol 16 were determined to 250°F., and extrapolated to 700°F.

6. For binary systems the influence of wide differences in volatility is such that the point of maximum pressure on the critical locus is shifted toward the compound of highest volatility, with the shift becoming more pronounced as the volatility spread increases.

7. A new correlation was devised on the apparent density of methane in fluid mixtures containing high molecular weight materials, based solely on the composition of the binary system.

In general, the research extended our knowledge of the behavior of fluid mixtures from pressures of

10,000 pounds per square inch to 25,000 pounds per square inch, by the design and utilization of equipment which permitted visual observations of phase phenomena occurring under pressures to 25,000 pounds per square inch and temperatures to 250°F.

Publication No. 950

Microfilm copy of complete manuscript 442 pages at 1 1/4 cents, total cost \$5.53, paper enlargements 6" x 8", at 10¢ per page. Available from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-80

THE DESIGN, CONSTRUCTION, AND OPERATION OF A HIGH TEMPERATURE, HIGH PRESSURE PLANT

Cedomir M. Sliepcevich, Thesis (Ph.D.)
University of Michigan, 1948

The purpose of this investigation was to design and construct a continuous, small-scale plant for studying catalytic reactions at temperatures up to 1200°F. at pressures up to 10,000 psi and to demonstrate its operation.

Part I deals with the theoretical aspects of high pressure, high temperature plant design and the practical difficulties encountered in such designs. Complete, detailed calculations are given for the design and construction of the individual pieces of equipment. The subject of closures and mating surfaces for high pressure, high temperature service is critically discussed. Several recommendations, which are believed to be absolutely essential to successful design, are given.

Continuous operation of the plant at elevated pressures and temperatures confirmed the applicability of this equipment for studying chemical reactions over a wide range of pressures, temperatures, and space velocities.

Part II deals with the effect of pressure (up to 9000 psi) on the decomposition of Butanol-1 at 760°F. in the presence of alumina-silicate catalyst. The following conclusions were drawn:

(1) At a given rate of feed, the decomposition of Butanol-1 increases with increasing pressures up to a certain point and thereafter decreases with increasing pressures. The exact pressure at which maximum decomposition occurs was not determined. At 2500 psi (ga) the decomposition is less than at 750 psi (ga) but greater than at zero pressure (ga). The decomposition at 9000 psi (ga) is less than at zero pressure (ga).

(2) In the presence of alumina-silicate catalyst at 760°F., the major decomposition reaction that takes place is the direct dehydration of butanol-1 to mixed butenes and water. Complex side reactions, involving only the butenes, subsequently occur; the extent of these side reactions increases with increasing pressures. The major side reactions are the condensation of the mixed butenes to higher molecular weight substances.

(3) The rate of decomposition of butanol-1 over the alumina-silicate catalyst is primarily controlled by the rate of adsorption of the butanol. At higher pressures the rate of surface reaction or the rate of desorption of the water formed in the dehydration decreases the rate of decomposition.

Publication No. 965

Microfilm copy of complete manuscript 356 pages
at 1 1/4 cents, total cost \$4.45, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-95

ECONOMICS

ORGANIZATION OF THE LABOR MARKET UNDER PLANNED ECONOMY

Arunchandra Chhotalal Chhatrapati, Thesis (Ph.D.)
University of Michigan, 1948

The object of this study is to analyze the effects of planning on the organization and functioning of the labor market.

Economic planning refers to a conscious choice of economic priorities by some public authority. In this study two types of planning are considered: Socialist planning and Capitalist planning. The former implies communal ownership and operation of the means of production with free markets for labor and consumer goods. In Capitalist planning, on the other hand, the primary object is to maintain full employment with the aid of fiscal and monetary policies of the state.

The experiences of planning in Russia and the war economies of the United States and Great Britain are analyzed, although they have limited application to the problem at hand.

In Russia, after a period of experimentation, the planning authority adopted the market system of labor allocation through wage differentials and individual choice. With the advent of planning, the function of wage determination was taken over by the planning authority from trade unions. Wages are determined according to capitalist principles.

In World War II, to meet large increases in manpower demands by the armed forces and industry, Britain employed conscription and direction in manpower mobilization and allocation, while the United States relied primarily upon voluntary cooperation. In spite of the danger of inflation, and the use of coercion and patriotic appeals, wage adjustments were necessary to aid in allocation.

Under Capitalist planning an efficient system of employment exchanges, information regarding changing conditions of the market, and measures to stimulate labor mobility will be necessary to improve the allocation function of the labor market.

Under Socialist planning accounting wage units may be used for labor allocation. However, these units and the actual rates paid to workers will have to bear the same relationship between different occupations, if freedom of labor is to be preserved.

In a full employment economy, the twin aspects of wages - cost to employer and income to workers - make it extremely difficult to analyze the effects of wage changes on employment. But if the wage level is constantly pushed up beyond what is justified by productivity increases, inflation will be inevitable; and control of inflation involves too many administrative and political difficulties to be practical. Therefore, either trade unions must observe restraint through a national wage policy or the state will have to determine wages.

Under socialism distribution of the social product is determined by state action. Since there are no property incomes, the question of increasing the relative share of labor in the national income does not arise. Trade unions will bargain with the planning authority concerning the relative wage structure; but the wage level will be determined by the planning authority as a part of financial and production planning.

Publication No. 970

Microfilm copy of complete manuscript 227 pages
at 1 1/4 cents, total cost \$2.84, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-100

THE THEORY OF INDUSTRIAL DEVELOPMENT IN ECONOMICALLY UNDEVELOPED COUNTRIES

Ying Hsin, Thesis (Ph.D.)
University of Michigan, 1948

The rise of modern industry in the past few centuries has brought with it two major types of economic change. One is a decline of the unit cost of output arising from progress in the arts and from the economies of mass production. The other is a greater growth in total real income than in the size of population. This latter development has occurred because social conditions, rather than merely the economic and biological potential, determine people's attitudes toward child breeding, and because agricultural output is maintained or increased while industrial output is added to the total income in the course of technological progress.

This thesis, *The Theory of Industrial Development in Economically Undeveloped Countries*, deals with the principles and processes involved in an expanding industrial economy. The following conclusions are reached:

(1) The fundamental data requisite for an expanding industrial economy are:

1. Growth of population.
2. Increase in capital investment.
3. Technological improvement.
4. Appropriate governmental economic policy toward the national economy.

(2) In the course of industrial development labor would shift from the primary economic sector, where raw materials are produced, to the secondary and tertiary economic sectors, concerned respectively with the production of finished goods and the rendering of services. During this shift the

income per head would tend to increase and the sanitary and living conditions of the people would improve. This would reduce the death rate, and therefore the population would increase.

(3) The value of a factor of production is governed by its abundance relative to the other factors. Technological improvement would increase the available supplies of land and capital, and would economize the utilization of all three factors. But every kind of change in technology calls for some capital outlay, and thus technological improvement is possible only in a capital-accumulating society.

(4) Capital accumulation, rather than the abundance of either land or labor alone, is the distinguishing feature of a progressive economy. Three types of capital investment have different effects upon the national income: (1) Internal saving imposes pain costs upon the people; (2) Investment from abroad produces different and less favorable effects on the national income; (3) Credit expansion substitutes productive for unproductive consumption.

(5) In regard to the choice of an economic system, it is desirable to obtain maximum utility from the distribution of income and to obtain the maximum service from the allocation of resources. The distribution of income under a socialist system is better than under a capitalist system. But as regards the allocation of resources, state monopoly of economic activities, the lack of a rational pricing system, and the inefficient bureaucratic administration, etc., of a socialist economy are not favorable to industrial development. A balanced public and private enterprise system is superior to either the socialist or capitalist economic system.

Publication No. 963

Microfilm copy of complete manuscript 168 pages
at 1 1/4 cents, total cost \$2.10, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-93

EDUCATION

THE RELATIONSHIP OF SCIENCE DEFICIENCIES TO SUBSEQUENT ACADEMIC PROGRESS IN THE SCHOOL OF ENGINEERING AT MICHIGAN STATE COLLEGE OF AGRICULTURE AND APPLIED SCIENCE

C. Fred Clarke, Thesis (Ed.D.)
Michigan State College of Agriculture and Applied
Science, 1948

Background and Need of the Study. The New "Michigan College Agreement" together with the current influx of large numbers of deficient students and the variable and yet highly specialized entrance requirements specified by various engineering colleges led the author to study the effect of a lack of certain of these requirements upon subsequent academic achievement.

Definition of the Problem. This problem deals with the relationship of science deficiency to subsequent academic progress in the field of engineering. An analysis is made covering the relationship of entering deficiencies in science to the general achievement in college and also to the specific fields of science, mathematics and engineering.

Scope of the Problem. The problem was limited to Michigan State College and included all students registered in the School of Engineering and in Basic College with engineering preference during the fall term of 1946. The minimum time any student was studied was three terms with an average of approximately five terms for all students studied. A full survey of all deficiencies was made and included in the summary of the results of this study.

Data Necessary for this Study. These data were secured from the Record Room of the Registrar's Office of the College. The data include grade point averages of the total high school work and separate averages for science and for mathematics for all of

those who were deficient by one or more units of science upon entrance to college. Similar averages of the college work including a total average and sub-averages for science and mathematics and for engineering were taken for the first two terms attendance and for the remaining terms attendance. The individual results on the American Council's Psychological Examination were also acquired. There were over 200 such cases available.

This same record was taken for 264 selected non-deficient students (students who entered with all high school requirements completed). This group was used during the comparisons as a control group.

Results. By a comparison of the deficient with the non-deficient group it was found that:

(1) The percentage of drop-outs was greater from the deficient group.

(2) The average age of entry of the deficient group was almost one year greater than that of the non-deficient group.

(3) The deficient group was significantly lower in rank on the psychological test scores.

(4) The psychological test scores showed a highly significant difference in their correlations with the actual academic grades in the non-deficient and the deficient groups respectively. The results of this examination, in the cases covered in this study, gave extremely low correlations with either the college or high school grade point averages in the deficient group.

(5) The difference between the high school total grade point averages of the non-deficient and deficient groups was highly significant, with a probability of occurring fourteen in ten thousand by chance.

(6) The difference between these groups was less significant in a comparison of their college scores and this difference decreased from the first two terms to the remaining terms of college work.

(7) The scholastic progress of the two groups during the first two terms and during the remaining

terms was approximately the same when the difference in academic ability was adjusted by means of an analysis of co-variance.

Conclusions. The specific requirements seem to insure that on the average the student admitted without deficiencies has a higher academic ability than the student with science deficiencies. However, when allowance is made for this difference in applied academic ability, there is no significant difference in the academic achievement of the two groups in their college work.

Publication No. 972

Microfilm copy of complete manuscript 212 pages
at 1 1/4 cents, total cost \$2.65, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Care Number Mic A48-102

A FOLLOW-UP STUDY
OF ONE HUNDRED VETERANS
WHO WERE COUNSELED AT
THE CITY COLLEGE VOCATIONAL
ADVISEMENT UNIT

Margaret E. Condon, Thesis (Ed.D.)
New York University, 1946

To evaluate any counseling program adequately, a follow-up study is essential so that unwise or inadequate counseling may be overtaken and corrected. The purpose of this follow-up study of veterans is to determine:

1. Status of the veterans in terms of successful completion of training.
2. Status of the veterans in terms of non-completion of training.
3. Cause of non-completion of training.

The veterans followed through in this study were counseled under Public Law 16, which provides for the extension of educational and training opportunities to all veterans with 10 per cent or more service-connected disability, provided this impairment prevents them from returning to their previous occupation, or whose abilities are not utilized in a field of employment in their present or pre-service job.

When Veterans Advisement Units were established, a considerable problem was posed in setting up a standardized advisement procedure sufficiently flexible to allow for the wide variation in background. At the College of the City of New York, the process begins with a preliminary interview, in which information is recorded concerning the veteran. The man is next assigned to an adviser who discusses job objectives with him. On the basis of this interview,

the appraiser indicates the appropriate tests to be administered by the psychometrist. No set battery of tests is used but several standardized tests are available to meet the various levels of ability. In certain cases, no tests are given when the veteran has completed his undergraduate work. Based on test results, personal desire, past experience, education, and present disability, an objective is reached by the veteran and the counselor. When advisement is completed, the Vocational Adviser of the Veterans Administration reviews the case, and has the veteran sign the final certificate. A Training Officer of the Veterans Administration places the veteran in the training facility selected, to realize his objective, and follows him through until completion of training.

The main part of the study consists of one hundred case histories which show the results of on-the-job training. Tables included indicate that only six of the one hundred veterans who entered training can be considered completely rehabilitated. The largest number of veterans who abandoned training (30 per cent) did so because of their physical condition. Those who were reevaluated, or whose objectives were changed most frequently, were in the group of mental disorders ranging between 30 and 50 per cent. These veterans apparently had great difficulty in adjusting to the training program.

The outcome of the on-the-job training program for the one hundred veterans followed through in this study is not very encouraging. However, many factors must be considered before a blanket statement can be made that on-the-job training is not successful.

Many of these veterans were counseled when the training program was in its initial stage. Training Officers of the Veterans Administration faced a stupendous task in contacting employers, arranging training programs, and placing veterans in fields of their choice. Many adjustments had to be made to satisfy both veterans and employers. Additional material on

occupations is now available at the Units, and Training Officers have been stationed at each Unit, to eliminate the long delay of advisement and date of entering training.

The main difficulty in the completion of training seems to lie with the veteran. Reasons listed by the Veterans Administration include:

1. Mental Condition
2. Physical Condition
3. Finances
4. Lack of Interest in Objective
5. Lack of Background for Training Entered
6. Acceptance of Outside Employment
7. Did Not Desire to Attend Training Facility Entered
8. Entered Own Business
9. Family Matters

From the standpoint of therapy, it is considered very important that these veterans did get started in some field, regardless of the outcome.

The end results of a program of the size now being sponsored by the government cannot be judged by a follow-up study of one hundred veterans. It is hoped that this is only the beginning of many more studies on each level of training, namely, college, institutional training of non-college level, and on-the-job training. Only in this way can methods be improved, techniques changed, errors decreased, and advancement made.

Publication No. 945

Microfilm copy of complete manuscript 217 pages
at 1 1/4 cents, total cost \$2.72, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-75

THE DEVELOPMENT OF CRITERIA FOR THE
EVALUATION OF CITIZENSHIP TRAINING IN THE
SENIOR HIGH SCHOOLS

Theral Thomas Herrick, Thesis (Ph.D.)
University of Michigan, 1948

The purpose of this study was to create a list of "jury" rated criteria for the evaluation of the citizenship training techniques most commonly used by the average senior high school.

The investigation involved four major phases. The compilation of tentative criteria for the evaluation of citizenship training in senior high schools constituted the first phase. To that end the writer not only used the usual library channels of information but also such additional ones as the United States Office of Education, the Educational Policies Commission, the Michigan Department of Public Instruction, the Detroit Citizenship Study, personal interviews with educators, school administrators, teachers and students, and various graduate research studies secured from universities throughout the United States. The criteria thus collected were termed "Proposed Criteria" and classified under the sub-headings or areas of Course of Study, Teaching Methods, Student Life, Community Activities, School Administration, Evaluation of Results, and General Policies.

The second phase of the study involved submitting this list of "Proposed Criteria" to eighty-four selected high schools in the United States for additions, deletions, or re-statements. Fifty-four of these schools responded with valuable suggestions.

The third phase involved three steps: first, the construction of a citizenship education rating sheet containing 370 items stated in terms of the suggestions received from the cooperating schools;

The fourth, and final phase involved the tabulation, analysis, and interpretation of the ratings of the "jury", as well as the construction of an inventory for evaluating citizenship training techniques in senior high schools. This phase of the study was somewhat complicated but it was the most fruitful and therefore warrants further explanation. The following table with its sample items shows the form of the inventory.

Sample Items of the Citizenship Training Inventory	1 Index	2 Never	3 Rarely	4 Sometimes	5 Frequently	6 Invariably	7 Weight	8 Score
A. The Course of Study (What is taught about democracy):								
1. Does your high school course of study include learn- ing experiences that will give:								
a. Training in ob- jectivity and avoidance of prejudice?	100	0	1	②	3	4	5	10
b. Desirable atti- tudes toward home and family life?	88	0	1	2	③	4	4	12
	Total							22.

Note that this item of the inventory is stated as a question--a form which is thought to be more challenging than the pattern of statement employed in the development of the inventory. In Column 1 is given the computed index of values and in Column 7, the weight which should be employed in obtaining the score. Columns 2 to 6 represent the scale of values from Never to Invariably by which the schools can check the extent to which the foregoing criteria are being met in their respective citizenship practices. The numbers encircled ② and ③ represent the school's rating on the criteria in question. The number ten, i.e., encircled ② multiplied by the weight 5, gives the score on the first criterion; 12, i.e., encircled ③ multiplied by the weight 4, gives the score on the second criterion; 22, the total score on the two items.

Finally, a theoretical profile of citizenship activities was constructed from the results of the group judgments of the aforementioned "jury". This profile was designed to help schools visualize their respective achievements in the seven areas of citizenship training into which the criteria were divided.

In summary, this study has attempted to create an instrument that can be used to facilitate some objective evaluation of a highly subjective and dynamic area of education.

Publication No. 960

Microfilm copy of complete manuscript 294 pages
at 1 1/4 cents, total cost \$3.68, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilm, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-90

AN INTRODUCTION TO MUSICAL DEVELOPMENT

Walter E. Nallin, Thesis (Ed.D.)

New York University, 1946

This is a volume intended to be used as a textbook in college courses purporting to trace the evolution of the art of music. Because such courses are, of necessity, somewhat elementary in outlook and usually treat with only the larger aspects of musical development, this treatise deals only with the larger outlines of the history of music. However, a distinct effort has been made to eliminate the trivia which are occasionally found in volumes attempting to serve a similar purpose. For the most part, data has been derived from authentic sources and an attempt has been made to organize this material in a systematic, scholarly fashion. Biographical material and anecdotes relating to the lives of individual composers and performers have been entirely eliminated, although, in the list of supplementary readings appended to each chapter, the reader is referred to sources where such information may be obtained.

The specific problem confronting the author of such a document is to deduce some means of presenting material, by its very nature complex, in a manner clearly understandable to the general reader. Terms must be explained, definitions stated and examples quoted in an interesting, but at the same time scholarly, fashion. Motivation must be maintained but superficiality must not be permitted to enter.

Liberal education in this country has long recognized the necessity of including a study of the arts in the framework of a general education. While the recognition is granted, the allotment of time and course credit is more often than not grudgingly

made, with a consequence that the art is frequently treated in one semester in a course rarely exceeding thirty semester hours. The problem is further complicated since most students come to such a course with little or no background. Thus, the ideal text to be used must be designed primarily for the musically uninitiated student. It cannot be a technical treatise; rather, it should be a document that is factual in content, interesting in character and stimulating in effect. An Introduction to Musical Development attempts to meet these criteria.

There are ten chapters in this document. Two of these chapters are of a general nature, while the remaining eight are organized around the nexus of specific musical forms.

Chapter One entitled The Elements of Music is designed to give the reader a working knowledge of the basic elements of musical structure such as melody, harmony, rhythm, tonality, etc. The physical basis of sound as well as the foundational types of musical form are also treated. In this latter respect song form, theme and variations form, sonata form, and rondo form are explained and examples of each are quoted. More elaborate examples of these types of form are found in subsequent chapters.

Chapter Two, Steps in the Early Development of Music attempts a brief survey of the development of music from antiquity to the close of the Middle Ages. Separate topics are assigned to Music in the Life of Primitive Man, Music Among the Ancient Egyptians and Hebrews, Music in Ancient Greece, Rome and Islam, Music of the Early Christian Church, Early Secular Music, The Rise of Polyphony and Harmony, and The Development of Notation.

From Chapter Three to Chapter Ten primary emphasis is placed on the types of musical form found most frequently on concert programs today. Included thus are: Early Vocal Forms (Chapter Three), comprising a discussion of the canon, the motet, the

madrigal, the chorale and the area; Early Instrumental Forms (Chapter Four), treating with the fugue, the suite, the concerto grosso, the solo concerto and the overture; Large Vocal Forms (Chapter Five), elaborating on the Mass, the Passion and the Oratorio; Large Instrumental Forms (Chapter Six), discussing the sonata, the symphony and the string quartet; The Opera (Chapter Seven); The Art Song (Chapter Eight); Lyric Piano Forms of the 19th Century (Chapter Nine); and Large Instrumental Forms of Romanticism (Chapter Ten), including the symphonic poem and the symphonic suite. In each instance, after the discussion of a specific form, an example taken from the standard repertory is analyzed and thematic illustrations from the work are quoted. Some illustrations which are used include: The Messiah by G. F. Handel, The Mass in B Minor and the Passion According to St. Matthew by J. S. Bach, the Symphony Number 40 in G Minor by W. A. Mozart, etc.

Publication No. 944

Microfilm copy of complete manuscript 428 pages
at 1 1/4 cents, total cost \$5.35, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-74

GUIDANCE PROBLEMS ENCOUNTERED IN CERTAIN HIGH
SCHOOLS OF MICHIGAN: THEIR TYPES, FREQUENCIES,
AND IMPLICATIONS FOR TEACHER TRAINING

Stanley Kirke Norton, Thesis (Ph.D.)
University of Michigan, 1948

This study is an analysis of 4,682 guidance problems submitted during one school month to 235 teachers by 1,586 pupils in 57 public high schools located in 54 communities in both peninsulas of Michigan. Problem descriptions were obtained by means of a questionnaire, distributed in the spring of 1946 under the auspices and sponsorship of the Michigan Guidance Committee's Subcommittee on the Training of Teachers for Guidance.

Findings include the following:

The problems that beset high school pupils comprise many types, touching virtually every conceivable phase of their life in school, out of school, and beyond school. Moreover, these problems vary widely not only in type but also in degree of seriousness, ranging from simple, minor problems to those of truly critical importance. The area of highest frequency is that of the non-school-related problems, with school-related problems and post-school problems following in that order. The largest single subdivision, however, that of "Choice of Subjects," is found in the school-related category.

By virtue of her position, every teacher is inescapably a counselor--actual or potential. The fact that 235 teachers reported that 1,586 pupils had presented 4,682 problems to them in the course of one school month would indicate that pupils do not keep all of their problems to themselves, nor do they consult only their parents or other extra-school advisers. Indeed, they submitted to their teachers an average of nearly three problems apiece during that period of time.

A significant correlation exists between the amount of guidance training that a teacher has had and the number of problems reported by that teacher. The Pearson product-moment coefficient of correlation between the number of guidance courses and the number of problems is $.79 \pm .019$. Furthermore, the teachers having some guidance training constituted 75.7 per cent of the entire group, but the reported 88.1 per cent of the problems; likewise, they reported a mean of 23.1 problems each, whereas those without guidance training reported only 9.8 problems apiece.

Factors apparently having slight, if any, influence upon the total number of problems of all types are: size of school, sex of pupils, sex of teachers, age and grade placement of pupils, length of teachers' experience, and teachers' major field of study.

On the other hand, sex of pupils is reflected in the fact that the boys report more school-related problems, while the girls report more non-school-related and post-school problems. Further sex differences are found in the fact that girls are more inclined than boys to consult teachers of their own sex, particularly with regard to personal problems; moreover, while teachers of both sexes counsel pupils of both sexes, more women teachers counsel boys than men teachers counsel girls. The effect of age and grade placement may be seen in the fact that the older pupils have fewer school-related and more post-school problems, with the reverse being true of the younger pupils.

Publication No. 949

Microfilm copy of complete manuscript 227 pages
at 1 1/4 cents, total cost \$2.84, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-79

MARIA MITCHELL, AS AN EDUCATOR

Alice E. A. Priestley, Thesis, (Ph.D.)
New York University, 1947

Problem Stated and Defined

The problem is essentially to write a biography of Maria Mitchell as an educator, evaluating her contribution to higher education for women.

The life and times of Maria Mitchell are discussed; an exposition of the development of her character and education in preparation for the teaching of astronomy; a description of her teaching experience and training of students for research; an assertion of the distinctive and unique qualities of her theory and practice at that time; and a critical evaluation of the relationship of Maria Mitchell through her students to the education of women.

The problem has educational interest for the historian who is not so much concerned with the purely unique aspects of past experience as in the elements which may serve as a basis for tentative generalizations in analysing current issues and practices to find to what extent they contribute to contemporary theories and practices of higher education for women.

Methods of Procedure

The historical method of research is used throughout; that is, according to the conditions of external and internal criticism.

External criticism considers the factors influencing the thesis and seeks answers to the questions of century, country, customs, personality, character, and position in the field of education.

Internal criticism checks the accuracy and value of statements by reference to contemporary

writers, colleagues, critics. That is, the intersection of the lines of national growth are treated as foci about which there revolves a point of relationship between Maria Mitchell and the higher education of women.

Evidence for the Conclusions

Maria Mitchell was given a medal for the discovery of a comet in 1847. She was also given several honorary college degrees. Silliman's Journal published several of her articles on the planet Jupiter. She was President of the Woman's Congress and frequently spoke on higher education for women. Maria Mitchell was called to the Professorship of Astronomy at Vassar College and taught women who later became well-known astronomers.

A memorial in Nantucket, Mass., including Fellowships for women astronomers was established in 1902. Her name was placed on a frieze of The Public Library of the City of Boston, Mass. A tablet to the memory of Maria Mitchell is in the Hall of Fame, New York University.

Conclusions

Maria Mitchell, born August 1, 1818 at Nantucket, was educated in the elementary schools of the island, taught there for a few years, then became the local librarian.

When Miss Mitchell was called to the unsought position of Director of the Observatory and Professor of Astronomy at Vassar College, she accepted the opportunity to educate leaders among professional women. Her pride and enthusiasm for women's work increased until her death in 1889.

The early training and experience of Maria Mitchell gave her a practical background for teaching and an appreciation of the future for professional women. She was an educator of importance to her generation, an idealist, a stoic philosopher, a

famous woman astronomer, a leader in the feminist movement for higher education for women, and a woman of strong character.

Modification and Extension of Existing Knowledge

This thesis modifies existing knowledge by the description and exposition of the practice of the doctrine of discipline, interest, and will in education. It is an argument for the doctrine of will in education.

The thesis shows that the movement for women's rights was not a sex conflict but an effort to extend human rights to all people. It extends the history of the past to include the struggle of women to obtain equal opportunities with men for education on a college level.

The thesis adds another name to the list of people who consider mathematics to be not all logic, but also imaginative and poetic.¹

This work has made known the name and life of a famous woman astronomer to a thousand people who had not previously heard of her.²

An appreciation of the fighting spirit and professional pride of Maria Mitchell might persuade some modern teachers to remain in the profession and participate in a reformation of the public school system.

¹Sophie Kowalesky, Poincare, Weistrass, David E. Smith.

²Author's conversation and tally over a period of ten years.

Publication No. 939

Microfilm copy of complete manuscript 75 pages
at 1 1/4 cents, total cost \$1.00, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-69

THE PREPARATION OF A COURSE IN SAFETY
EDUCATION FOR TEACHERS OF HEALTH AND
PHYSICAL EDUCATION IN TRAINING

Don Cash Seaton, Thesis (Ph.D.)
New York University, 1947

Problem Stated

The problem was the preparation of a course in safety education for teachers of health and physical education in training.

With the realization that more school and college accidents occur in the Department of Health and Physical Education than in any other department, and that more and more administrators are looking to this Department to accept responsibility for the school safety program, the question of properly preparing prospective teachers for this task has become pertinent.

The purpose of this thesis was to supply reliable and much-needed safety information which would serve as a guide for teacher-education institutions in the preparation of future teachers of health and physical education.

In an effort to solve this problem, it was found necessary to determine the accident problems faced by the teacher of health and physical education; the knowledge and procedures required by the teacher of health and physical education in order that these problems might be solved; and the content and administrative procedures that should be included in such a course.

Procedure

To determine the types of accidents that occur in activities of the health and physical education program and their causes, it was necessary to:

1. Analyze the reports of State athletic benefit plans
2. Analyze the various studies and published reports of athletic and recreational accidents. Of these the most useful were Frank C. Lloyd's Safety in Physical Education in Secondary Schools; Floyd R. Eastwood's Safety in College Athletics; Accident Facts, published annually by the National Safety Council; A Study of Playground Accidents in Los Angeles; and Safety and Health in Organized Camps, by J. Edward Sanders.

To determine the knowledge and recommended procedures required in the teaching of health and physical education, the investigator:

1. Surveyed the State and city courses of study in safety, safety textbooks, pamphlets, and bulletins, from which questionnaires were prepared and distributed to leaders in the field. These questionnaires contained procedures of administrative safety controls, facility safety controls, and leadership and skill controls, which were the items most frequently advocated in the literature and considered by experts in the field to be the most essential. A total of 551 checklists were sent to leaders throughout the country representing all grade levels and both sexes. Of these, 391 were returned.

To determine the administrative procedures and content which should be included in the course, the investigator:

1. Tabulated and analyzed the results of the questionnaires. Those controls on which there was general agreement (75 per cent or more) became the standards or practices recommended as desirable for inclusion in the Course.
2. Established by questionnaire certain standards advocated by authoritative sources, such as Constructing the Teacher-Education

Curriculum by Frank J. Henry and Charles C. Hawkins and Curriculum Development in Safety Education by G. H. Reavis.

Presentation of the Findings in the Course

To justify the selection of course material, the investigator employed the techniques enumerated above and established 538 principles of safety control. Forty of these were general administrative controls, 12 general equipment and facility controls, 30 general leadership controls, while the remaining 456 were specific skill controls applying among the various 28 sports. The two most hazardous sports, apparatus and football, required 104 and 55 specific skill controls respectively, while the least hazardous, such as golf and tennis, required only 2 and 4 respectively.

Recommendations

1. Officials of teacher-preparing institutions should make use of this material in planning the curriculum for intraining teachers of health and physical education.
2. In-service coaches and teachers of health and physical education could utilize the safety controls determined by this study in an effort to make their physical education and recreation programs less hazardous.
3. Instructors of courses in the organization and administration of health and physical education could use the material to enrich the subject matter of such courses.
4. Various State officials, such as the State Director of Health and Physical Education, State officials of the High School Athletic Association and Athletic Benefit Plan, could use the material to improve the accident incidence in athletics.
5. Textbook writers could use the material to point out the recommended safety controls in the various sports.

Publication No. 941

Microfilm copy of complete manuscript 421 pages
at 1 1/4 cents, total cost \$5.27, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-71

RELATED INFORMATION FOR THE COMPREHENSIVE
GENERAL SHOP IN A FUNCTIONAL JUNIOR HIGH
SCHOOL INDUSTRIAL ARTS PROGRAM IN NEW YORK
STATE

Robert Long Thompson, Thesis (Ed.D.)
New York University, 1947

The Problem

The purpose of this study was to develop a manual of instruction sheets to be used by the junior high school industrial arts teacher as an aid in presenting related information to the students. These sheets are a series of short stories or vignettes relating to the materials most often used in the comprehensive general shop.

Each story presents the romance, history, source, manufacture, and uses of these materials. The reading matter is designed to captivate the interests of the adolescent student and serve as motivation for his further study and research.

Need for the Study

In addition to the teaching of manipulative skills the industrial arts teacher is generally held accountable for the presentation and teaching of related information. It is quite evident, from an examination of instructional materials relating to the industrial arts, that they have been based too much on tool processes and do not give the broad educational approach to the work that it deserves.

Not only is there a dearth of this instructional material for the modern day industrial arts courses but very little of the available material is adequate for study by the junior high school student.

In too many cases the "project" has been the final aim of the industrial arts teacher, rather than the "general education" of the adolescent. Too

little thought has been given the following objectives: a) Exploration, b) General guidance, c) Social habits and insights, d) Consumers knowledge and appreciations, and e) Correlation and integration.

There is every evidence that the few available publications concerned with information relating to the materials used in the industrial arts, have failed to consider the following factors: a) to capture the adolescents' purposeless, wayward attention often enough, and to hold it long enough, to impress him with the significance of a few derived interests which may serve as a new base of operations from which to push on to further development; b) to satisfy the rapid expansion of interests and vivacity of the imagination; c) to satisfy in part the principles of learning; d) to build up the reading vocabulary through association with words in context; and e) to recognize the emergence and development of vocational interests which are often confused and varied.

Procedure Used in Collecting Data

A jury of teachers, supervisors, and other leaders in the field of industrial arts education were asked to cooperate in the selection of the materials most often used in the comprehensive general shops of New York State.

Individual conferences were held with the various staff members of the Department of Vocational Education, School of Education, New York University. As a result of these conferences, fifteen to twenty basic materials that might be studied were selected from the following specialized industrial areas: 1) woodworking, 2) metalworking, 3) electrical, 4) graphic arts, 5) textile, 6) ceramic, and 7) miscellaneous.

A questionnaire was then developed using these materials as a frame of reference. Thirty-four questionnaires were mailed. Twenty-eight of them were returned. From the returned questionnaires, lists of materials were tabulated showing the materials most commonly used in the various industrial areas represented in the comprehensive general shops tested.

The materials selected for study in the document were chosen from the fifteen most important materials listed in each of the seven industrial areas.

Methods Used in Writing the Instruction Sheets

It was determined, from the questionnaire, that three of the industrial areas--wood, metal, and electricity - were well represented in the school shops. Textiles, ceramics, and graphic arts were poorly represented.

The manual consists of fifty-one short stories covering sixty-one topics. Ten topics were selected from each of the following industrial fields; wood, metal, electricity, and miscellaneous. Seven topics were selected from ceramics, textiles, and graphic arts.

The information for the stories was taken from published industrial brochures, periodicals, encyclopedias, and technical books. Each story contains approximately twelve type written sheets and is very well illustrated. Great use was made of interesting incidents and anecdotes and the reports are well correlated with history and geography.

Each story was read orally by small groups of junior high school students. Difficult and technical words were listed. References and a glossary accompany each story. Word definitions were taken from Thorndike's Century Junior Dictionary. The reading time of each story is between fifteen and twenty minutes.

Publication No. 942

Microfilm copy of complete manuscript 934 pages
at 1 1/4 cents, total cost \$11.68, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-72

THE AMERICAN WAR-BLIND AS AIDED
BY THE FEDERAL GOVERNMENT

Jacob Twersky, Thesis (Ph.D.)
New York University, 1947

The Problem and Its Importance

The aim of the investigator was to present an historical account of the efforts of the American government in behalf of the war-blind.

The main purpose of the investigation was to obtain the historical perspective for making recommendations for the improvement of the present American program. In order to fulfill this purpose more adequately, historical treatments of the efforts in behalf of the war-blind in Great Britain and the British Empire, France, and Germany were also undertaken.

There were several other purposes for the investigation: to provide a unified source of information for those in work for the war-blind, for those in general work for the blind, and for those of the general public who are interested, and for the war-blind themselves. It was also hoped that the record of the investigation might serve as an historical document.

Previous Studies of the Problem

There has been no previous research into the problem as stated. Articles and reports have appeared but they have dealt only with isolated phases of the broad problem. The information was available but no one had attempted to synthesize it or reach any conclusions based upon it.

Methodology

The historical method was employed. All sources were examined critically and the information was synthesized to exhibit trends. To supplement the historical method, the investigator visited the centers of the present American program for the war-blind and relied upon his own experience in work for the war-blind.

In organizing the information, clarity was sought. Following an account of the development of basic American legislation in behalf of all the war-injured, the specific enabling legislation for the blind, along with descriptions of how this legislation was implemented, were presented. Insofar as was possible, the results of the programs for the war-blind were indicated. The same was done, although less extensively, with the European nations that were treated. Then, conclusions were drawn and recommendations were made for the improvement of the present American program.

Conclusions

The most important findings of the investigation are listed below.

1. Legislation designed to aid the war-injured has always existed in the United States. Until the participation in World War I, however, it was concerned chiefly with pensions, hospitalization, and domiciliary care. But in 1917, rehabilitation, encompassing re-education and vocational training along with physical restoration, was inaugurated for the war-injured.

2. Not until the passage of the pension law of July 4, 1864, were the war-blind mentioned specifically in legislation for the war-injured. But from colonial times onward, the war-blind benefited from the provisions for total disability. From 1864 onward, however, the war-blind have been dealt with as a distinct group among the war-injured.

3. The rehabilitation of the American war-blind of World War I began in the base hospitals in France and culminated at the training center for the war-blind at Evergreen, Maryland. In the absence of adequate records, it was estimated that by 1925, one thousand veterans of World War I were blind from either direct or delayed causes of blindness incurred while in service. The follow-up records of the trainees were even more inadequate, making it impossible to judge correctly the results of the program. In the instances, however, where records were kept fully, they indicated that the rehabilitated war-blind succeeded economically and socially.

4. The present American program for the war-blind of World War II functions under three main divisions. The Army and the Navy each sponsor programs of re-education for blindness. The Veterans Administration assumes the responsibility of all discharged blinded servicemen.

5. Since a newly blinded person requires several years in which to make his adjustment, it is still too early to judge the results of the present program. Nevertheless, there are some indications of the pattern these results may take. In two studies conducted in 1946, it was shown that about fifty per cent of the blinded veterans of World War II were either employed or undergoing training.

6. The investigation of the programs for the war-blind in Europe revealed two items that are significant in the search for ways of improving the present American program. First, in each of the nations studied, there existed centralized programs which pooled facilities and experienced personnel. Second, each found it necessary to establish a system which required employers to hire a quota of their employees from among the disabled.

Recommendations

Based on the historical perspective of the investigation, ten recommendations were made for the

improvement of the present American program. It was recommended:

(1) that representatives of the Veterans Administration, similar to those now stationed at the Army's social adjustment center for the blind, be stationed also at the United States Naval Hospital in Philadelphia;

(2) that for total blindness, whether there has been anatomical loss of the eyes or not, a fixed rate of pension should be awarded;

(3) that records be maintained of those who are likely to become blind from delayed causes;

(4) that, when all blinded soldiers have been discharged from the Army, the social adjustment center for the blind, of the Army, should be taken over by the Veterans Administration;

(5) that the regional offices of the Veterans Administration undertake out-patient work in orientation with blind veterans;

(6) that follow-up on a blind veteran should last for as long as he lives;

(7) that blind veterans be afforded special privileges in obtaining loans from the government for starting businesses or farms;

(8) that more space, equipment, and personnel be made available for the programs for the blind in the nine veterans homes and hospitals;

(9) that only personnel experienced in work for the blind should be employed in carrying out the program for the war-blind;

(10) that a quota system for the employment of the disabled be established.

Publication No. 940

Microfilm copy of complete manuscript 214 pages
at 1 1/4 cents, total cost \$2.68, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-70

EDUCATIONAL PSYCHOLOGY

INTROVERSION AND EXTROVERSION IN THE HIGH SCHOOL AND THEIR RELATION TO AGE, SEX, ACADEMIC SUCCESS, AND LEADERSHIP

Reginald DeKoven MacNitt, Thesis (Ph.D.)
University of Michigan, 1930

A survey of previous studies reveals that introversion and extroversion are quite obviously very significant traits leading to a better understanding of human personality, whether normal or abnormal. The previous lack of an instrument to measure these tendencies in high school pupils, the uncertainty about sex and age differences, and the absolute dearth of studies of high school pupils showing the relationship between these traits and achievement in school subjects, gave evidence of the need for such an investigation as this.

Test items suited to the high school level were prepared for sixty traits and administered to representative groups of junior and senior high school pupils. Subjecting these results to statistical treatment resulted in the selection of thirty items for the final form of the Test for Introversion and Extroversion. This test correlated $.883 \pm .014$ with the criterion accepted as representing the best placement of a pupil on the introversion-extroversion scale, $.865^* \pm .019$ with 856 associate ratings, and $.763^* \pm .024$ with 139 teacher ratings. The reliability of the test is $.842^{**} \pm .019$ when odd and even scores are correlated and $.871 \pm .028$ when the test was repeated four weeks later. The distribution of scores on the test approximates the normal probability curve.

*Corrected for attenuation.

‡Predicted for the entire test.

The results from the study of 964 junior and senior high school pupils analyzed on the basis of age, support those studies which have found age differences. There was a gradual increase towards introversion on the basis of grade, age, and grade-at-age from younger to older pupils. For retarded pupils, the tendency was towards introversion in Grades VII and VIII with a drop occurring in the ninth grade and the tendency from there on definitely towards extroversion. For accelerated pupils, the tendency was towards extroversion in Grades VII to X and markedly towards introversion in Grades XI and XII.

This study is in harmony with those which have revealed significant sex differences. For 964 junior and senior high school pupils, extremely significant sex differences existed. While the mean scores of the boys in grade-at-age remained relatively constant, the girls were more extroverted than the boys in Grades VII and VIII, approximately the same in Grades IX and X, and more introverted in Grades XI and XII. Girls one year retarded in Grades XI and XII tended toward extroversion in contrast with a tendency towards introversion for girls in the same grades who were accelerated.

Analysis of the results of introversion-extroversion in relation to school marks of 964 junior and senior high school pupils lead to the following conclusions:

1. On the average, those pupils with extrovert tendencies received the better grades in Grade VII and VIII, also in the grade-at-age groups in general.
2. There was no reliable difference in marks for introverts and extroverts in Grades IX and X and in the retarded groups in general.

When the results were analyzed for 721 junior high school pupils to determine the influence of popularity with the classmates and number of offices held in organized groups, a relationship was established. The mean introvert-extrovert scores of boys

and girls named ten or more times as the most popular in their home room were definitely more extroverted than the group as a whole. For both boys and girls, there was also a definite trend towards extroversion with an increase in the number of offices to which the pupils had been elected. The mean scores of those pupils who had been elected to no offices were slightly more introverted than the average for the group as a whole.

While this investigation has contributed something towards the measurement of introversion-extroversion traits in high school pupils and established a limited number of relationships, it should accomplish much more in pointing the way for further experimentation.

Publication No. 924

Microfilm copy of complete manuscript 236 pages
at 1 1/4 cents, total cost \$2.95, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-54

GEOGRAPHY

THE DANUBE BASIN--PATTERNS IN POLITICAL GEOGRAPHY

George Kiss, Thesis (Ph.D.)
University of Michigan, 1945

The lands of the Danube, lying between western and eastern Europe, represent an area of transition. Geographically and ethnographically they are lands of great diversity; there are significant contrasts in economic and political development between Czechoslovakia and Austria, with their highly developed industries and relatively homogeneous national structures, and Rumania and Yugoslavia, predominantly agricultural and with a crazy-quilt pattern of nationalities. The objectives of this thesis include a brief survey of salient geographical features and patterns; an account of previous attempts to organize the Danube valley; and an attempt to indicate the most important measures to be taken to insure peace and prosperity for this region.

On the geographical stage of the Danube lands history has created political and ethnic patterns that survive to our day. Because of the position of the Danube valley between western and eastern Europe, it was for centuries a battle ground of the conflicting ambitions of great powers. When, in the 19th century, the Habsburgs finally established their control over most of the Danubian lands, militant nationalism, brought forth by the French Revolution, was already at work undermining the foundations of the Habsburg empire. Attempts to replace the dual control of Germans and Hungarians in Austria-Hungary by a multi-national state have failed, and the First World War destroyed the only regional political organization in the Danube valley that has existed in modern times. In its stead the "Succession States" created by the peace treaties of 1919 tried to carry

on, handicapped by excessive political and economic nationalism. Plans to bring these states together such as those proposed by the Little Entente, by the French statesman Tardieu, and by the Stresa Conference of 1932, did not succeed, partly because of the centrifugal political tendencies inherent in the Danubian states; partly because of the strong opposition of Germany and Italy. Thus the German assault of World War II found the Danubian states unprepared, and all of this area became part of the German realm.

Plans and policies for the future of the Danube valley should place primary emphasis on economic reconstruction. Among the very first tasks of reconstruction should be certain important shifts in agrarian production involving increased emphasis on protective rather than energy foods, increased production of industrial crops, and introduction of co-operative marketing of agricultural products. Since basic raw materials: iron, coal, and petroleum, are not available in large quantities in this area, the development of heavy industries is not likely. Rather, emphasis should be on decentralization of industries utilizing local raw materials such as bauxite and copper, and on the building up of food industries utilizing agricultural surpluses. Improvements in communications, involving the building of new highways, and an increased emphasis on water transport would contribute materially to the raising of living standards. Finally, education of the people to new and better techniques of production as well as in the art of getting along with their neighbors is an indispensable adjunct to a reconstruction program, designed to improve the lot of sixty million people living in one of the critical regions of our world.

Publication No. 923

Microfilm copy of complete manuscript 110 pages
at 1 1/4 cents, total cost \$1.38, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-53

THE SANTA MARIA VALLEY,
SANTA BARBARA COUNTY, CALIFORNIA

Clifford Herbert MacFadden, Thesis (Ph.D.)
University of Michigan, 1948

In very early reconnaissance surveys, the Santa Maria Valley presented to the author several land-use and settlement problems peculiar to sub-humid regions, and one problem rather unique within the sub-humid region. The rather unique problem concerned the outer limits of intensive garden agriculture, why it had developed with such sharp areal limits only to be replaced immediately beyond by a completely different agricultural economy. Many of the other attendant geographic problems concerned the actual pattern of land-use: the presence of considerable acreages of relatively low-profit crops on expensive lands, and the presence of many large dairy herds being supported on these same expensive and highly productive garden lands.

Answers to the most pressing geographic problems in the Santa Maria Valley area depended heavily upon a detailed land-use study and interpretation. The field research in land-use was greatly expedited through the regular use of a light airplane in general field surveying and in aerial photographic work. All stages of the field work, from the initial reconnaissance, through the compilation of a new land-use map, to the final "spot detail" studies by photography, were in large part effected by use of this modern heretofore untried geographic "field tool". The slow flying light plane was used, flying at varying altitudes from 300' to 3000' above ground elevation. The author flew alone, mapped on previously prepared base maps with speed precision, and gained photographic data

for subsequent study purposes at any point and from any angle or height desired.

A very marked correlation was found to exist between the pattern of land-use in the Santa Maria Valley, and the distribution of landforms, underground water, and to a lesser extent soils. The "intensive garden farming" lands are limited almost exclusively to the alluvium filled "valley floor", which in turn overlies the underground water reservoir. Beyond the valley floor the low terraces have been in residence sufficiently long that there materials are semi-consolidated and more impervious to water. The association of both high-profit and low-profit crops on the highly productive and expensive lands is dictated by the need of crop rotation--to maintain soil fertilitities and control diseases. Similarly, the great number of large dairy herds is maintained as much for their contribution to the fertility of the land through natural fertilizers as for their direct money profit from dairy produce.

Publication No. 953

Microfilm copy of complete manuscript 178 pages
at 1 1/4 cents, total cost \$2.23, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-83

GEOLOGY

GEOLOGY OF THE SIERRA DE LOS MUERTOS AREA, COAHUILA, MEXICO, AND APTIAN CEPHALOPODS FROM THE LA PENA FORMATION

William Elliott Humphrey, Thesis (Ph.D.)
University of Michigan, 1947

Into the Parras Basin of southeastern Coahuila plunge the westward-trending ranges of the Sierra Madre Oriental. Rugged, anticlinal uplifts of Upper Jurassic and Lower Cretaceous strata alternate with synclinal valleys of Upper Cretaceous shales. Near-shore deposits--sandstone and conglomerates--point to the proximity of the Coahuila Peninsula strand line or to rising island masses in the Portlandian and Tithonian seas. Most of the structural elements in the area are overturned to the north as part of a Laramide movement toward the ancestral massif of the Coahuila Peninsula. The plunging western ends of the anticlines are symmetrical or very slightly asymmetrical with the steeper dips to the north, but in their middle portions the folds become complicated, commonly showing overturning and fanfolding. Some small thrusts are noted, but large-scale overthrusting is conspicuously absent. North-south normal faults bound salients of greater overturning along the flanks of the folds and are probably responsible for the positions of most of the cross canyons in the area studied. Ore bodies of lead-zinc-silver replacements in dolomitic limestones and dolomites are located along these normal cross faults or at their intersection with the axes of the anticlines. 42 species of cephalopods belonging to 11 genera are described from the La Pena formation of upper Aptian (Lower Cretaceous) age. Of

these, 2 genera and 28 species are described as new and the beds are correlated with formations elsewhere in northern Mexico and in the Gulf Region of the United States.

Publication No. 933

Microfilm copy of complete manuscript 258 pages
at 1 1/4 cents, total cost \$3.23, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-63

HISTORY

THE ENGLISH GAME LAWS WITH PARTICULAR REFERENCE TO REFORM IN THE NINETEENTH CENTURY

Homer Louis Knight, Thesis (Ph.D.)
University of Missouri, 1945

Game law reform, one of the most vexatious problems that plagued nineteenth century British politicians, blended well with the conflicting social forces of the Victorian age. Its history extends into the medieval period when laws to prevent the inhabitants from taking game from the royal forests were rigorously enforced. By the end of Elizabeth's reign the old system had fallen into disuse and even the greatest legal authorities knew little of the manner in which it functioned. James I, unable to revive old customs, developed a trend started in the days of Richard II, by demanding an income of forty pounds from land as a qualification to take game. Charles II increased the requirement and, by permitting his subjects to appoint gamekeepers on their own estates, encouraged them to preserve animals and fowls of chase and warren. The stringency of the laws increased when William III, Anne and George I created administrative devices that granted country gentlemen a monopoly of sporting rights.

As new industrial and farming methods developed, public opinion opposed the special privileges landholders possessed, and in 1796 the game problem became a matter of sufficient consequence to encourage Whig politicians to use it as a weapon against the landed classes. After the Napoleonic Wars, the movement to reform the game laws was strengthened by a series of parliamentary investigations that disclosed the abuses and corrupt practices tolerated under the system and raised the issue to a place of primary importance in political circles.

The new industrial classes, taking advantage of the declining power of the gentry, demanded that the sale of game be declared legal and all qualifications to sport be removed. In 1831 an act was passed that abolished the old code and gave the farmers qualified property in the game found on their holdings, but permitted the landlord, by bargaining with the tenant and inserting a clause in the lease, to reserve the sporting privileges for himself. After 1831 the game question declined in importance until the manufacturing interests, during the agitation for the repeal of the corn laws, revived the problem in an attempt to drive a wedge between the landlords and their tenants. The resulting inquiries revealed the serious damage agriculture sustained from the over abundance of game, and for a time the repeal of the laws appeared imminent, but after the abolition of the corn laws the farmers, left to their own devices, permitted the subject to drift. Occupiers, however, gained a slight concession in 1848 when parliament passed a law granting them unrestricted permission to take hares found on their property.

An increasing interest in the anti-game law movement paralleled the advance of the franchise question in the sixties, and the agitation for the repeal of the laws led to an investigation in 1872 and 1873, which emphasized the use of game and rabbits as articles of food and commerce. Seven years later the farmer won an inalienable right to take ground game from his occupancy, but the privilege of destroying feathered game still depended upon his ability to bargain with the landlord under the law of 1831.

After 1880 the game question declined in importance, but the devastation of crops during World War I led to the enactment, in 1923, of a measure to discourage the breeding of winged game. In 1939, when the inevitability of World War II became apparent, parliament passed a statute that required the destruction of rabbits in areas where they interfered with agricultural pursuits, and the defense measure

of the same year permitted the Minister of Agriculture and Fisheries to command that rabbits, hares or other vermin be killed. The difficulties that were known in the nineteenth century as "the game problem" have apparently been adjusted to meet the demands of the farmer and an industrial society.

Publication No. 925

Microfilm copy of complete manuscript 319 pages
at 1 1/4 cents, total cost \$3.99, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-55

HISTORY, MODERN

THE NATIONAL CAREER OF BLANCHE KELSO BRUCE

Sadie Daniel St. Clair, Thesis (Ph.D.)

New York University, 1947

This study aims to interpret the national career of Blanche Kelso Bruce, a Negro, who held legislative and administrative positions between 1875 and 1898. It proposes to analyze the nature of his services and to evaluate their significance. The need for an objective study of Blanche K. Bruce's career is recognized by those students of politics and of human culture who are concerned with the part played by Negroes themselves in the reconstruction of the nation. In this post-war era when the contribution of each minority group to American political life is significant, the need for background biographical studies of minority peoples is increasingly felt.

Without personal papers the investigator was forced to make a "flank" attack upon Bruce's career. Through the use of several leads manuscript data pertaining to the life and times of Bruce have been located. Correspondence with his relatives and friends, state archivists, state historical societies, college and depository libraries, county clerks, recorders of deeds, genealogists, and historians has produced a few first-hand accounts which have been assembled as the Blanche K. Bruce Collection and loaned to the Moorland Foundation of the Howard University Libraries, Washington, D. C. for other students of Bruce. Considerable data have been acquired from government records and documents, annual and quadrennial reports, and newspapers. Attempt has been made to collect statements from different sources on the same subject to serve as checks for validity and reliability. These facts have been analyzed to show not only the forces that may have operated to

bring Blanche Kelso Bruce into the political life of the nation, but also the conditions that gave rise to his economic advancement and political power.

His was the career of a quondam slave who might have seemed doomed to obscurity, yet whose life became associated with the political affairs of the nation for almost a quarter of a century. Having emancipated himself during the Civil War by going to a free state, Bruce seized the opportunity offered by Reconstruction to migrate to Mississippi. There he became elected to the highest position of a county official and soon aspired to a seat in the United States Senate. Achieving this goal he sought political preferment at the close of his senatorial career and was appointed Register of the United States Treasury. Failing to secure this post under Harrison's administration, he was named Recorder of Deeds of the District of Columbia. He conducted an effective campaign for appointment as Register of the Treasury under McKinley. Successful in this effort, he died in office.

Dominated by personal ambition, Bruce utilized every opportunity to achieve his purpose. While he reached the highest distinction in office-holding of any Negro, he failed to offer his race vigorous leadership. He was hardly thought of as a great force in American affairs during his life-time; yet he imposed himself upon the political scene as no other Negro has done, and members of his race point with pride to two striking achievements. He was the only Negro to serve a regular six-year term in the United States Senate; and he set the precedent for a Negro to serve as Register of the Treasury until the advent of the Democratic administration in 1913. His real legacy, however, is one of inspiration. To aspiring Negro youth he may become a symbol of success in public office.

While interpretations may vary, this is certain: Blanche Kelso Bruce was the most astute politician of the Negro race who emerged from the caldron of

Reconstruction. A delineation of his career may not only serve as a pattern for inquiry into the careers of other Negro legislators of that period, but it may also direct attention to the roles of Negro leaders who were not Congressmen. It is hoped that this study will elicit a series of biographical productions which will present a synoptic picture of the function of the Negro in American life during the last third of the nineteenth century. The primary significance of this investigation and of others of a similar nature lies in the discernment of those elements which may serve as bases for tentative generalizations in analyzing current trends, issues, and practices in this area. Designed therefore, to contribute to a deeper understanding of relevant problems today, this effort should be meaningful to teachers and students of social studies.

Publication No. 938

Microfilm copy of complete manuscript 332 pages
at 1 1/4 cents, total cost \$4.15, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-68

THE PUBLIC CAREER OF HERBERT SPENCER HADLEY

Lloyd Edson Worner, Jr., Thesis (Ph.D.)
University of Missouri, 1946

The public career of Herbert Spencer Hadley was in part a cause and in part an effect of the progressive movement in Missouri.

Herbert S. Hadley was born in Olathe, Kansas in 1872. He was graduated from the University of Kansas in 1892 and received his law degree from Northwestern University in 1894. He began the practice of law in Kansas City that same year, and in 1898 his public career began when he was appointed to the office of assistant city counselor. His record in this office led to his election as prosecuting attorney for Jackson county in 1900, and in performing the duties of this office he attracted more than local attention. In 1904, at the age of 32, he was elected attorney-general of Missouri. For four years he cooperated with Joseph W. Folk in bringing about reforms typical of the progressive era. As attorney-general Hadley successfully prosecuted the Standard Oil Company for violations of the Missouri anti-trust laws. This case brought him nation wide acclaim, and it was followed by other successful prosecutions of similar cases.

The rising tide of progressivism in Missouri had led to the election of Joseph W. Folk as governor in 1904, although all other state offices were captured by Republican candidates and the state's electoral vote went for Theodore Roosevelt. In 1908 Hadley was elected governor, the first Republican to be elected to that office since 1870. But due to a politically divided legislature he was able to accomplish little in the way of progressive legislation. During his four years in office he constantly brought to public attention the need for changes in

government, and he became actively and prominently identified with the progressive wing of the Republican party.

In 1912 he was one of the leaders of the move to bring about the nomination of Theodore Roosevelt. At the Republican National Convention in June of that year, Hadley acted as the floor-leader of the Roosevelt forces. His conduct in the convention made it seem as though at one time he would be selected as a compromise candidate, but partly because of the unwillingness of either Taft or Roosevelt to agree to such a solution, and partly because he had good reasons for not desiring the nomination, the move to nominate Hadley collapsed. After the nomination of Taft, he declined to follow Roosevelt in the third party movement because he believed that he could best serve the cause of progressivism by remaining within the Republican party.

Although he was prominently mentioned as a candidate for the Republican presidential nomination in 1916, he never again held public office because his health failed and he was forced to move to Colorado. From 1916 to 1923 he was Professor of Law in the University of Colorado. The dry climate was helping him to recover from tuberculosis, but the high altitude affected his heart and it became necessary for him to move to a lower altitude. He was seriously considered for the presidency of the University of Missouri, but the condition of his health and political opposition precluded the appointment. In 1923 he was called to the chancellorship of Washington University in St. Louis. As an educator and administrator, Hadley emphasized training for citizenship and a practical application of the social sciences to modern American life.

His health grew progressively worse, but during the last years of his life he performed one more public service by helping to start the movement for reforming American criminal justice. As a member of the National Crime Commission he prepared and

published a report which in the opinion of Newton D. Baker pointed the way to further progress for years to come. As a member of the Council of The American Law Institute. Hadley was largely responsible for the preparation by that organization of a model code of criminal procedure, which was adopted by the Institute in May of 1930, slightly less than three years after his death.

Publication No. 928

Microfilm copy of complete manuscript 367 pages
at 1 1/4 cents, total cost \$4.39, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-58

LANGUAGE, ENGLISH

THE ENGLISH QUESTION PATTERNS
FROM 1100-1600

Russell Cospers, Thesis (Ph.D.)
University of Michigan, 1948

The present-day question patterns are mainly periphrastic. With the exception chiefly of be and have as full verbs, the question is formed by the selection of a function word and a scheme of arrangement: "What can I take?" and "Do you like apples?" A feature of such a pattern is the retention of the S-V order like that of statements: "He likes apples."

The purpose of the thesis is to find out what the patterns were during the period from 1100 to 1600, to see whether they show a trend toward present-day patterns, and to find out something of the rise and spread of the do periphrasis. The procedure is to abstract the questions from representative texts and to classify them according to the selection and arrangement of essential features. From the citations a description is given of the practice in each century, and from the series of descriptions a chronological development is presented.

The twelfth century citations show that sixty-three percent of the questions use a pattern with the subject following a full verb: "hwy comen ge hider." Thirty-seven percent of the questions use a function word with the subject preceding a full verb: "hu mei he lufian god." This proportion is changed in the thirteenth century to fifty-eight percent with a function word and forty-two without. The percentages of function word questions in the following three centuries are fifty-six, fifty-four, and sixty-one. There is a somewhat irregular but consistent trend toward present-day patterns.

Significantly, the thirteenth century shows an increase of question types in which the subject precedes the verb, and the first do as a question marker can be dated before 1360. There are scattered instances of do questions in the fifteenth century, but not until the sixteenth century do we see a regularly increasing percentage of do types. In Cam-paspe, dated 1584, do questions alone outnumber the types with a full verb preceding the subject.

In the twelfth century citations the negative is ne, and it precedes the verb or the function word. In the late thirteenth century there is one citation in which not follows a full verb plus subject, and one instance of a not following a function word plus subject. In the fourteenth century occur the first instances of a negative following immediately the function word or the full verb. The older preceding negative largely disappears by the end of the fourteenth century. The double negative is virtually limited to the fourteenth and fifteenth centuries.

About 1390 occurs the first instance of a function word which depends on a preceding full verb: "what scholde I more?"

The do periphrasis was adopted, perhaps concurrently with the rise of word order as a major grammatical device, to bring inversion questions with a V-S order into conformity with the majority S-V order.

Publication No. 973

Microfilm copy of complete manuscript 230 pages
at 1-1/4 cents, total cost \$2.88, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-103

LANGUAGE, LATIN

ADEQUACY OF THE LATIN WORD LIST OF THE COLLEGE ENTRANCE EXAMINATION BOARD AS A MEANS FOR TEACHING WORDS OF LATIN DERIVATION OCCURRING IN THE GENERAL VOCABULARY OF THE ENGLISH LANGUAGE

Carolyn Elizabeth Bock, Thesis, (Ph.D.)
University of Michigan, 1948

The purpose of this study is to determine to what degree the vocabulary of the high school Latin course contributes to English vocabulary. The English vocabulary with which this study is specifically concerned is the vocabulary of general education. It is the author's aim to analyze the abundant wealth of our tongue lying between the words at the lower level; i.e., those words we employ in supplying our physical needs and those words at the higher level, which the technicians use in conducting their highly specialized activities.

When the analysis of that portion of our English vocabulary which lies between the two extremes stated above was completed, it became the purpose of this study to determine the degree of success or failure of the present course of study in Latin, specifically in respect to the claim that an important value to accrue from the study of Latin is its contribution to English vocabulary.

The Thorndike Century Senior Dictionary, a standard dictionary for the secondary school, was selected as the yardstick to be used as a measure of general vocabulary. The first and tenth words from each column on each page in the Thorndike Century Senior Dictionary, approximately 4118 words, were selected as a cross-section of English vocabulary, and this list was regarded as a representative sample. The English words derived from Latin, approximately

2110, became the part of the sample used for further examination and analysis. This group was further refined by eliminating words coming into English from Latin but actually through Latin from Greek, words derived from Vulgar Latin, from Medieval Latin, from Late Latin. This reduced the number of Latin derived words to 1916.

The next step was to determine whether or not the Latin words from which these 1916 English words in the sample were derived were included in the Latin Word List. The Latin Word List, more commonly referred to as the College Board List, is the accepted basis of high school Latin vocabulary. The English words in the sample were separated into those derived from Latin words assigned to the vocabulary of first and second year Latin in the College Board List, the vocabulary of third and fourth year Latin in the College Board List, and words not in the College Board List. English words derived from Latin compounds were put into other groups.

Finally, the College Board List was examined to determine how many of its words were used and the frequency with which these words were used in building English words appearing in the sample.

Significant among the findings were these: 51.56 per cent of the words in the sample derived from Classical Latin were derived from Latin words assigned to the vocabulary of first and second year Latin in the College Board List. 22.91 per cent from the vocabulary of third and fourth year Latin, or a total of 74.47 per cent of the words, were derived from Latin words included in the vocabulary of the College Board List. 25.52 per cent were derived from Latin words not included in the vocabulary of the College Board List.

One realized that the College Board List was designed to provide vocabulary for the authors read, thus providing for the attainment of the immediate objective of Latin study, rather than for the purpose of teaching English words of Latin derivation. It is

apparent that the majority of high school pupils who discontinue the study at the end of two years would have no experience through their Latin with words assigned to the third and fourth years of the List and not even included in the List because the source words had not been used by the traditionally read authors.

It would seem to be a practical step, since derivation is regarded as an objective by the authors of modern Latin textbooks, for the College Board to recognize the contribution of Latin to English vocabulary insofar as that aim would not interfere with the major purpose of the Latin Word List. Alteration and/or implementation of the College Board List would mean a change in the reading material of the first two years of high school Latin. This calls for further experimentation.

Publication No. 931

Microfilm copy of complete manuscript 177 pages
at 1 1/4 cents, total cost \$2.22, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-61

LITERATURE, ENGLISH

ALTERATIONS OF SHAKESPEARE 1660-1710: AND AN
INVESTIGATION OF THE CRITICAL AND DRAMATIC PRIN-
CIPLES AND THEATRICAL CONVENTIONS WHICH PROMPTED
THESE REVISIONS

Louis M. Eich, Thesis (Ph.D.)
University of Michigan, 1923

This dissertation is a study of some of the principal alterations of Shakespeare's plays from 1660 to approximately 1710, and an investigation of the critical and dramatic principles and theatrical conventions which prompted these revisions. Among the alterations dealt with are the following:

Tate's King Lear
Howard's Romeo and Juliet
Dryden's Troilus and Cressida
Davenant's Law Against Lovers
Dryden's Antony and Cleopatra
Lansdowne's Jew of Venice
Cibber's Richard III
Sheffield's Julius Caesar
Cibber's King John
Lacy's Taming of the Shrew
Davenant's and Dryden's Tempest
Dennis's Coriolanus
Gildon's Measure for Measure

The critical and dramatic principles and theatrical conventions discussed as prompting these revisions were found to be as follows: (1) poetical justice, (2) teaching a moral, (3) the hero cannot be a villain, (4) tragedy and comedy must not be mingled, (5) the dramatic unities of time, place, and action, (6) "refining" the diction, (7) literary craftsmanship, (8) contemporary political interest, (9) the popular actor, (10) the evolution in staging, (11) "operatizing" Shakespeare.

The situation in the theater at the beginning of the Restoration is outlined. The theater is shown to be the "toy" of the court and nobility. Playwrights, actors and producers were favored visitors at court and in the homes of the nobles. Some of the noblemen tried their hand at playwrighting. The alterations evolved out of this background. Alleged great admiration for Shakespeare is shown to be largely lip service. The revision often proved more popular than the originals, in fact, in some cases crowded the originals "off the boards." This was particularly true of revisions of King Lear by Nahum Tate, an alteration of Richard III by Colley Cibber, and a revamping of the Tempest by John Dryden and William Davenant. Studies are made of the dramatic criticism and the rules of dramatic technique as enunciated by the authors of the alterations and other writers of the Restoration. The supreme confidence and complacency of Dryden in his superiority over Shakespeare in knowledge of the rules of dramatic art is revealed in several of the prefaces to the alterations.

The conclusions reached at the close of the dissertation are: (1) these alterations constitute a temporary interruption in the true appreciation of Shakespeare's plays, and (2) the alterations did fit into the theatrical conditions and dramatic theories of the Restoration more fully than the originals. The alterations were the inevitable product of a highly individualized period in the history of the theater of England. Perhaps they should be evaluated not as Shakespeare at all, but strictly as Restoration drama.

Publication No. 920

Microfilm copy of complete manuscript 211 pages
at 1 1/4 cents, total cost \$2.64, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-50

WILLIAM WHITEHEAD: A STUDY OF HIS LIFE,
HIS PLACE IN HIS DAY, AND HIS WORKS

Frederick Louis Neebe, Thesis (Ph.D.)
University of Missouri, 1947

In his own day William Whitehead (1715-1785) was a considerable figure in the literary and dramatic world. His poems frequently went into several editions, one of them into a fifth edition. He was appointed poet laureate in 1757 and held the position until his death in 1785. His plays were successful enough to make him one of the respected dramatic authors of his time, and his advice on the presentation of plays by other writers was sought and followed by Garrick.

His poetry reflects a number of contemporary literary trends; it shows the influence of Pope, Spenser, Gray, Milton, and perhaps Swift. Pope, whom he had met in the Winchester school-days, wielded the greatest influence over him. Whitehead used Popean heroic couplets extensively and agreed with Pope's general attitude toward the purpose and methods of literature. Like Pope, he was dominantly neoclassic, although minor traces of romanticism are discernible in his work. For his poems he borrowed themes and ideas from a number of other writers, among them Pope, Young, Akenside, Gray, Joseph Warton, Fielding, Addison, Herodotus, John Philips, Martial, Swift, and Phaedrus.

In An Hymn to the Nymph of Bristol Spring Whitehead gave his own estimate of his poetical achievement, a surprisingly accurate one:

. . . let mine
My humbler weaker verse, from scantier rills
Diffusing wholesome draughts, unheard, unseen,
Glide gently on, and imitate thy spring.

Although he realized that he would not be ranked among the major poets, he felt that he had some poetical skill and insisted that he would use this ability. While he did not attain a high place in English poetry and while his works have been relegated almost to the state of being "unheard, unseen," nonetheless he merits some attention from students of English literature. Two of his poems, "The Enthusiast" and "Je ne sçai quoi," deserve to be remembered, the first for its interesting portrayal of the current conflict between romanticism and neoclassicism, and the second for its sheer charm. Both poems have a lasting quality in them. Others of interest include A Charge to the Poets (1762), Variety (1776), and The Goat's Beard (1777).

The odes, written as part of his duties as laureate, while not of any real brilliance and of little poetical value, have a certain sincerity and a tone of genuine patriotism that left them above the low level of the adulatory odes of his predecessor in the laureateship, Colley Cibber.

With the exception of his two comedies, Whitehead published only a small amount of prose. His three essays in The World are in the general tradition of Addison's Spectator papers.

The popularity of his first tragedy, The Roman Father, is attested by the fact that it was given about seventy-five performances in England and Ireland and at least forty in America. It is further interesting not only because, like Addison's Cato, it exalts patriotism, but also because on several occasions (1783, 1785, 1800) it was produced as a vehicle of tribute to the American Father, George Washington. In Creusa, his second tragedy, Whitehead took a Greek play, the Ion of Euripides, stripped it of its supernatural elements, rationalized the story, and made it into a compact and well motivated tragedy of mother-love and revenge. In some ways it is his most admirable work. The School for Lovers, Whitehead's first attempt at comedy,

must be included in any discussion of eighteenth-century sentimental comedy. It further reveals Whitehead's ability to delineate delicate feeling. One indication of its influence in the eighteenth-century is the number of "School for" plays that followed it, notably Sheridan's School for Scandal. A Trip to Scotland proved to be a successful farce. Garrick, who produced all of Whitehead's plays, also employed him as a reader of plays and accepted his critical judgments.

Because of his dramatic achievement, primarily his authorship of The Roman Father, Creusa, and The School for Lovers, and because of the importance of a few of his poems, Whitehead merits classification as a writer, who, though of secondary importance, still deserves serious consideration in any study of eighteenth-century literature.

Publication No. 971

Microfilm copy of complete manuscript 272 pages
at 1 1/4 cents, total cost \$3.40, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-101

HERMANN STEHR IN THE LIGHT OF
LITERARY CRITICISM 1898-1940

Harold Stewart Courant, Thesis (Ph.D.)
University of Michigan, 1948

This dissertation analyzes the critical writings on Hermann Stehr appearing between 1898 and 1940. Major emphasis is placed on the period 1898-1933, hitherto largely neglected. The study proposes to give a more complete picture of the author's philosophical and literary range, and to determine his place in modern German literature.

Part A of the introduction sketches the literary scene at the turn of the century when Stehr was struggling for recognition, while Part B contains a brief survey of his life and works. Chapters II and III examine the critical publications of the early period 1898-1921 and of the intermediate period 1922-1933, respectively. The early years of Stehr criticism were characterized by a variety of literary classifications and by a constant search for critical terminology with which to describe him. Between 1922 and 1933 the early confusion and misconceptions of the critics were giving way to a clearer recognition of the author as a mystic thinker and writer. The critics now attempted interpretations of Stehr's mystic philosophy of life and considered to some extent the formal aspect of his works. They prepared the ground for the decisive critical works to follow.

Chapter IV gives a brief treatment of Stehr criticism from 1933 to 1940 when a sharply-defined split in critical attitude becomes apparent. Many of the German critics adjust themselves to the "national-political" approach to literary criticism advocated by the National Socialist régime, and inject

into their interpretations elements foreign to Stehr's mystic Weltanschauung.

Chapter V summarizes the main aspects in the growth of critical opinion about Stehr and furnishes a brief outline of his philosophy and its development. From the large number of essays and monographs examined emerges the picture of a profound mystic narrative writer, whose philosophy is a synthesis of the mystic thought of the ages, though strongly influenced by his own mystic experience. It has been difficult for the critics to present Stehr's Weltanschauung systematically because of the elusive nature of mysticism in literature. Stehr's persistent urge to express his mystic yearnings through narrative art and lyric poetry distinguishes him from most other mystics. He has succeeded in evolving a fine epic style in which a realistic world becomes transparent in the light of eternal values. His consistent emphasis on the ideal of the purification and spiritualization of the individual, which enables man to gain the unio mystica, set Stehr apart from other great writers of his time, and kept him independent of literary movements and theories. Stehr holds a singular, perhaps unique position in modern German literature and ranks as its foremost mystic narrative writer.

Publication No. 969

Microfilm copy of complete manuscript 242 pages
at 1 1/4 cents, total cost \$3.03, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-99

LITERATURE, SPANISH

SOURCES OF "LA CRISTIADA"

Sister Mary Edgar Meyer, Thesis (Ph.D.)
University of Michigan, 1948

The purpose of this study is: (1) to present the principal aspects and phases of the political system and culture of Spain during the Golden Age and to show to what extent La Cristiada, an epic poem by Fray Diego de Hojeda, O.P., is a reflection and an interpretation of the culture of this age, and (2) to make a scientific study of the sources Hojeda may have used in the preparation of his religious epic.

The results of the investigation show that La Cristiada expresses the spirit of the century of world discovery and colonization, of religious renovation and religious reconquest. Through its satire, its bitter denunciation of abuses, and its wholesome admonitions, it portrays not only the political and cultural life of Spain and her colonial possessions but also makes a valuable contribution to the Counter Reform. Its intricate structure is a manifestation of the complexity of the Golden Age. As a poem representative of the literary baroque by its exuberant style and fusion of Pagan and Christian elements, it is a manifestation of a new artistic expression of an independent age. Moreover, the variety of material used by the poet in the lavish adornment of his work epitomizes the learning and culture of the age in which he lived.

The vast material of which Hojeda availed himself extends from the Iliad of Homer to the latest works of his contemporaries. Greek and Roman literatures left their impress upon La Cristiada in its classical allusions and Homeric similes as well as in its structure and form, while the Italian epic exercised a considerable influence particularly in

the matter of details and in the selection of the ottava rima for its verse form.

Intimately acquainted as Hojeda was with the content of Sacred Scripture and the writings of the Church Fathers, he found in the Bible and Patristic writings his chief sources of inspiration. The many examples in La Cristiada where Hojeda embellished the history of the Passion with traditions spring from the Apocrypha. Whether or not his indebtedness to these early sources was direct in every case is doubtful since much of this material found its way into the general current of later Christian tradition. Hence, the principal secondary or intermediary sources of Hojeda's legendary material are found in the commentaries on the Gospels, the Legenda aurea, and the works of his contemporaries, chiefly those of Ribadeneira, Cabrera, Villegas, Luis de Granada and Baronius.

The account of the destruction of Jerusalem by Titus, Hojeda drew from Josephus' Jewish Wars. For the data on the pre-Christian sects, he depended on the New Testament, Epiphanius' Adversus haeresis and Josephus' Antiquities of the Jews, and for the data on the heresies he consulted the Church Fathers and the decrees of the Councils of the Church. Ribadeneira, Marieta, De Voragine, and the Chronicle of the Dominican Order made the chief contributions to his hagiography and martyrology.

Hojeda's angelology has the sure foundation of Scripture and the Summa theologica. It is also very probable that he was familiar with the works of Pseudo-Dionysius, Saint Bernard and Saint Gregory which treat of the celestial hierarchy. In his demonology, especially concerning the fall of the angels, the nature of the evil spirits and their place of punishment, he likewise followed the teachings of Saint Thomas. But with regard to the relation which exists between the evil spirits or demons and the pagan gods he is influenced by the Christian apologists and the early Church Fathers. The blending of the Pagan and the Christian, a characteristic

achievement of the Renaissance, is due partly to the influence of Dante, Vida, Tasso, Hernández Blasco and Camoens, and partly to reminiscences of Virgil's hell described in the Aeneid.

In his use and application of mythology, Hojeda's debt to the ancients, both Greek and Latin writers is certainly great. His astronomy, based on Ptolemy's Almagest is supplemented by Sacro Bosco's Sphaera mundi and probably by Alfraganus' Elementa astronomica. The elements of astrology which he combines with mythology in the planet portraits are drawn from the most popular texts on astrology of his time, such as Ptolemy's De praedictionibus astronomicis, Joannis Hispalensis' Epitome totius astrologiae, and Aratus' Phenomena.

To enumerate all the writers from whom Hojeda may have taken a thought or received a suggestion for La Cristiada is beyond the scope of this abstract. A study of his poem gives the impression that he was acquainted with the majority, if not all, of the principal and most popular works available in his day. In the light of the findings through this investigation of sources, we are forced to conclude that if an epoch is a man, of no one can it be said with more reason than of Fray Diego de Hojeda.

Publication No. 948

Microfilm copy of complete manuscript 481 pages
at 1 1/4 cents, total cost \$6.02, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-78

THE DEVELOPMENT OF THE CHRISTMAS PLAY IN
SPAIN FROM THE ORIGINS TO LOPE DE VEGA

Beatrice P. Patt, Thesis (Ph.D.)

Bryn Mawr College, 1945

This dissertation constitutes a systematic study of the sources and characteristics of the available Christmas plays written in Spain from the twelfth century to the period of Lope de Vega. Some of the plays written in Spain and Spanish America in the seventeenth and eighteenth centuries are summarized briefly in an Appendix for the purpose of ascertaining the extent to which the traditions of the earlier presentations were followed; a second Appendix consists of a list of titles of lost Christmas plays.

The origins of the Christmas drama in Spain, as in the other countries of Western Europe, may be sought in the extra-liturgical practises of the Catholic Church, notably in the trope Quem queritis in praesepe which was attached to the Christmas liturgy. There exist early texts of tropes from Huesca and Vich, but there are no records of extended Latin plays to form the transition between these tropes and the twelfth century Auto de los Reyes Magos, a 147 line fragment written entirely in the vernacular. After the early appearance of this Auto there are only scattered and indirect references to Christmas performances until the latter part of the fifteenth century, when Gómez Manrique's Representación de Nuestro Señor was performed between 1467 and 1481. A few years later, in the works of Juan del Encina (1492) and his followers, a type of Christmas play is gradually formed which appears to have been a typical expression of the early sixteenth century. It is based primarily on the story of the Nativity as recounted in Luke II:11-15, and

on the liturgy. It is essentially popular and lyrical in tone. The rustic sayagués is adopted as a distinctive means of expression, and the plays usually include comic elements, music and dancing. A few of the works written between 1492 and 1530 begin to manifest a didactic rather than a popular tendency, but the rustic type of Christmas play mainly concerned with the Nativity is definitely predominant.

After 1530 the Christmas drama develops a more complex character. The popular and lyrical treatment of the story of the Nativity gives way to the exposition of theological problems and of dogma. The Nativity is no longer the principal theme; plays on the Annunciation, the Circumcision, the Flight to Egypt and on other events connected with the Christmas season begin to emerge. Only one presentation, the Danza del Santísimo Nacimiento, by Suárez de Robles, clearly recalls the genuinely popular tone of the plays written before 1530. Of the other dramas composed between 1530 and 1590, some are essentially didactic, while a few combine this tendency with the rustic treatment of the shepherd theme. The dramatists of this period still adhere closely to biblical and ecclesiastical sources, but allegorical and apocryphal elements are occasionally included.

Throughout both periods, three types of plays are distinguishable: 1. The popular and lyrical shepherd play centering in the Nativity 2. The didactic plays 3. The partly popular, partly didactic plays. Of these three types, the rustic shepherd drama enjoyed the greatest vogue.

The reason for this preference may be threefold. First, early evidence points to extra-liturgical practices consisting of dancing and singing which centered in the manger, and perhaps it is due to these popular associations of the Nativity that the dramatization of that event was preferred to all the other events associated with the Christmas season.

Also, this preference was further strengthened by the predilection of the Renaissance for the figure of the shepherd who lived in close touch with Nature and was therefore close to God. At the same time, as the social consciousness of Spain became sharpened, the rustic emerged as a representative of an oppressed social class. No other figure on the stage could embody so effectively the new aspirations of the common man.

The scarcity of genuine shepherd plays in the period between 1530 and 1590 may be attributed to the Counter-Reformation, under the influence of which the theological content of religious plays increased at the expense of popular elements. Later, after the clouds of religious conflict cleared, the Nativity play appeared once again with all the former emphasis on the popular treatment of the shepherd theme.

Publication No. 936

Microfilm copy of complete manuscript 340 pages
at 1 1/4 cents, total cost \$4.25, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-66

MATHEMATICS

A GENERALIZED CONVOLUTION FOR THE FINITE FOURIER TRANSFORMATION

Arvid Werner Jacobson, Thesis (Ph.D.)
University of Michigan, 1948

A generalized Fourier convolution $F^*(x)$ of a function $F(x,y)$ integrable with respect to x and y in the square $0 \leq x \leq \pi$, $0 \leq y \leq \pi$ for the iterated finite sine transformation

$$\bar{f}_{ss}(n,n') = S \left\{ S \left\{ F(x,y) \right\} \right\}$$

is defined as follows:

$$\begin{aligned} F^*(x) = & - \int_0^x F(x-y,y)dy + \int_x^\pi F(y-x,y)dy \\ & + \int_0^{\pi-x} F(x+y,y)dy - \int_{\pi-x}^\pi F(2\pi-x-y,y)dy. \end{aligned}$$

When $n' = n$, it can be shown that

$$S \left\{ S \left\{ F(x,y) \right\} \right\} = C \left\{ \frac{1}{2} F^*(x) \right\}$$

In case $F(x,y) = F_1(x)G_2(y)$, the function $F^*(x)$ is the ordinary convolution, or Faltung,² of the two functions F_1 , and G_2 .

For the iterated finite cosine transformation, and sine-cosine and cosine-sine transformations similar theorems are established. Also a number of corollaries resulting from specialization of the object function $F(x,y)$ is deduced.

With the aid of this generalized convolution very general steady state boundary value problems

¹Abstract of dissertation by the same title submitted December 1947, in the University of Michigan.

²R. V. Churchill, Modern Operational Mathematics in Engineering, McGraw-Hill, 1944, p. 276.

(in the strict sense) are resolved into simpler problems, that is, into problems with simpler boundary conditions as well as source functions. Moreover, this method enables us to extend the Duhamel integral formula from time to space coordinates.

A number of key functions is introduced and the solutions of some basic boundary value problems are expressed in terms of two of these functions; namely, $B_{01}(x,u)$ and $B_{12}(x,u)$. These functions are defined as follows:

$$B_{01}(x,u) = \frac{2}{\pi} \sum_{v=0}^{\infty} \arctan \frac{\sin x \sinh u}{\cosh (2v+1)\pi - \cos x \cosh u}$$

$$B_{12}(x,u)$$

$$= \frac{1}{\pi} \log \prod_{v=0}^{\infty} \frac{e^{2(2v+1)}}{4 [\cosh(2v\pi + \pi - u) - \cos x] [\cosh(2v\pi + \pi + u) - \cos x]}$$

The solutions of more general boundary value problems in two and three dimensions are then expressed in terms of the solutions of the basic problems.

A table of the finite sine and cosine transforms of the key functions is included. Also, a verification is made of some basic solutions obtained.

The Green's function of $\Delta u = 0$ in a square and with the boundary condition $u = 0$ is given in terms of the function B_{12} , which is better suited, we believe, for the use of the engineer than the forms in which it is found in literature. In the appendix the following relation between the function B_{12} and the Weierstrass's Sigma function is established:

$$\begin{aligned} \frac{1}{2} B_{12}(x - \xi, \pi - y - \lambda) \\ = - \frac{1}{\pi} \log \left| \sigma(z + \tau, \pi, \pi i) \right| + c \left[(x - \xi)^2 \right. \\ \left. - (y + \lambda)^2 \right] + k \end{aligned}$$

where c and k are constants, and $z = x + iy$, $\tau = \xi + i\lambda$.

CONTRIBUTIONS TO THE STUDY OF THE ASYMPTOTIC DEVELOPMENTS OF ANALYTIC FUNCTIONS

Franklin Chapin Smith, Thesis (Ph.D.)
University of Michigan, 1934

In this dissertation, the author obtains the asymptotic developments of the function $f(z)$ defined by the Maclaurin series

$$(1) \quad f(z) = \sum_{n=0}^{\infty} g(n) z^n$$

when $g(n)$ is assumed to have certain special forms

The first chapter contains a review of important general theorems due to W. B. Ford and E. W. Barnes.

In the second chapter, these general theorems are applied to the function defined by the series

$$(2) \quad f(z) = \sum_{n=0}^{\infty} \frac{z^n}{(n+\theta)^{\beta}} e \quad |z| < 1$$

where β and θ are any constants (real or complex) except that $\theta \neq 0, -1, -2, \dots$. The author obtains the following theorems:

THEOREM: If $\theta \neq$ a positive integer, the function $f(z)$ defined by (2) has the following asymptotic development for all values of z of large modulus:

$$(3) \quad f(z) \sim - \sum_{n=1}^{\infty} \frac{1}{(\theta-n)^{\beta}} z^{-n} + \\ + \pi \frac{[\log(-z)]^{\beta-1}}{(-z)^{\theta}} \sum_{n=0}^{\infty} \frac{(-1)^n \left[\frac{1}{\sin w} \right]_{v=\theta}^{(n)}}{n! \Gamma(\beta-n) [\log(-z)]^n}$$

in which, if $z = \rho e^{i\phi}$, we take $\log(-z) = \log \rho + i(\phi + \pi)$ and $-2\pi < \phi \leq 0$.

THEOREM: If $\theta =$ a positive integer, the function $f(z)$ defined by (2) has the following asymptotic development for all values of z of large modulus:

$$(4) \quad f(z) \sim - \sum_{n=1}^{\theta-1} \frac{1}{(\theta-n)^{\beta} z^n} - \sum_{n=\theta+1}^{\infty} \frac{1}{(\theta-n)^{\beta} z^n} \\ - \frac{[\log(-z)]^{\beta}}{z^{\theta}} \sum_{n=0}^{\infty} \frac{(-1)^n}{n! \Gamma(\beta-n+1)} \left[\frac{\pi w}{\sin \pi w} \right]_{w=0}^{(n)}$$

in which, if $z = \rho e^{i\phi}$, we take $\log(-z) = \log \rho + i(\phi + \pi)$ and $-2\pi < \phi \leq 0$, and in which the first summation on the right is understood to be lacking in case $\theta = 1$.

The author also discusses the dominant terms in (3) and (4) and uses the above theorems to determine the location and nature of the singularities of the function (2).

The third chapter contains a discussion of the asymptotic developments of the function

$$(5) \quad f(z) = \sum_{n=0}^{\infty} \frac{h(n) z^n}{\Gamma(n+p)}$$

where p is any constant (real or complex) except that $p \neq 0, -1, -2, \dots$. The author obtains the following theorem:

THEOREM: If $H(n)$, when regarded as a function $h(w)$ of the complex variable $w = x + iy$, is single-valued and analytic throughout the finite w -plane and, when considered for values of w of large modulus lying in the half-plane $R(w) > a$, where a is some assignable number, may be expressed in the form

$$(6) \quad h(w) = c_0 + \frac{c_1}{w+p} + \frac{c_2}{(w+p)(w+p+1)} + \dots + \frac{c_s + \delta(w, p, s)}{(w+p) \dots (w+p+s-1)}$$

in which the c_i are constants and $\lim_{|w| \rightarrow \infty} \delta(w, p, s) = 0$;

then, for values of z of large modulus, the function $f(z)$ defined by (5) has the following asymptotic developments:

$$(7) \quad f(z) \sim - \sum_{n=1}^{\infty} \frac{h(-n)}{\Gamma(p-n) z^n} \quad - \frac{3\pi}{2} < \arg z < -\frac{\pi}{2},$$

$$(8) \quad f(z) \sim e^z z^{1-p} \sum_{r=0}^{\infty} \frac{c_r}{z^r} \quad -\frac{\pi}{2} < \arg z < \frac{\pi}{2}.$$

If, in addition, we assume that a is an arbitrary negative number, then, for values of z of large modulus, we may also write

$$(9) \quad f(z) \sim e^z z^{1-p} \sum_{r=0}^{\infty} \frac{c_r}{z^r} - \sum_{n=1}^{\infty} \frac{h(-n)}{\Gamma(p-n) z^n}$$

$$\arg z = \pm \frac{\pi}{2}.$$

The author also discusses the dominant terms in (7), (8) and (9), and the corrections necessary if the function $h(w)$ has singularities.

The author applies the above theorem to the function

$$(10) \quad G_{\beta}(z, \theta) = \sum_{n=0}^{\infty} \frac{z^n}{\Gamma(n+1)(n+\theta)^{\beta}}$$

previously discussed by E. W. Barnes. He obtains the following theorem which is consistent with the results given by Barnes:

THEOREM: For values of z of large modulus, the function $G_\beta(z, \theta)$ defined by (10) has the following asymptotic developments:

$$(11) \quad G_\beta(z, \theta) \sim \frac{[\log(-z)]^{\beta-1}}{(-z)^\theta} \sum_{n=0}^{\infty} \frac{(-1)^n [\Gamma(w)]_{w=\theta}^{(n)}}{n! \Gamma(\beta-n) [\log(-z)]^n}$$

$$-\frac{3\pi}{2} < \arg z < -\frac{\pi}{2},$$

$$(12) \quad G_\beta(z, \theta) \sim \frac{e^z}{z^\beta} \left\{ 1 + \sum_{n=1}^{\infty} \frac{a_n}{z^n} \right\} \quad -\frac{\pi}{2} < \arg z < \frac{\pi}{2},$$

$$(13) \quad G_\beta(z, \theta) \sim \frac{e^z}{z^\beta} \left\{ 1 + \sum_{n=1}^{\infty} \frac{a_n}{z^n} \right\} + \frac{[\log(-z)]^{\beta-1}}{(-z)^\theta} \sum_{n=0}^{\infty} \frac{(-1)^n [\Gamma(w)]_{w=\theta}^{(n)}}{n! \Gamma(\beta-n) [\log(-z)]^n}$$

$$\arg z = \pm \frac{\pi}{2},$$

where if $z = \rho e^{i\phi}$, we take $\log(-z) = \log \rho + i(\phi + \pi)$, and where the a_i satisfy the difference equation

$$(14) \quad a_{n+1}(\beta+1) - a_{n+1}(\beta) = (\beta + n + 1 - \theta) a_n(\beta + 1).$$

Publication No. 930

Microfilm copy of complete manuscript 54 pages
at 1 1/4 cents, total cost \$1.00, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-60

MEDICINE

THE WATER PRECIPITATION TEST AS AN INDEX OF HEPATOCELLULAR DAMAGE

Jean Robertson Clawson, Thesis (Ph.D.)
Bryn Mawr College, 1946

The functions of the normal liver are so diverse that there are numerous possibilities of change as a result of disease, obstruction, mechanical or chemical damage. Various clinical and laboratory tests of liver function have been devised in an attempt to ascertain the deviation from normal in various types of hepatic disease. This paper discusses briefly the functions of the normal liver, the mechanisms of the production of jaundice, and those liver function tests which are most commonly used. In addition, the literature pertaining to infectious (epidemic) hepatitis and to homologous serum jaundice is reviewed, and brief mention is made of the use of many liver function tests in cases of these virus diseases.

A new serum reaction, the water precipitation test, for the study of hepatic disorders is presented. Distilled water is layered above inactivated serum in micro-test tubes. Readings are made after incubation at 37° for 2 hours, and at 4° overnight. A positive reaction is characterized by the appearance of a cloudy ring or, more rarely, a particulate precipitate at the interface between serum and water. About 13 per cent of a limited number of sera from normal individuals were positive. The majority of the sera positive in the water test were obtained from volunteers in the clinical, late incubation or early convalescent stages of infectious hepatitis or of homologous serum jaundice. Since these diseases are known to cause diffuse hepatic inflammation, with parenchymal cell necrosis and disruption of the liver cell columns, it is deduced that a positive water precipitation test is indicative of hepatocellular

damage. No correlation could be shown between the water test and other non-specific serum reactions, the cephalin-cholesterol flocculation test, the thymol test and the colloidal gold reaction. Nor was there any demonstrable relationship between the water test and serum concentrations of bilirubin, protein, cholesterol and cholesterol esters, erythrocyte sedimentation rate, prothrombin levels and the retention of bromsulphalein. The urinary excretion of bilirubin, urobilinogen and urobilin was also unrelated to the water precipitation test.

A few sera from individuals with cholelithiasis, acute yellow atrophy of the liver, obstructive jaundice, or jaundice following cholecystotomy were negative. Isolated samples from cases of "hepatocellular jaundice" and from a case of "hepatitis associated with diabetes" were occasionally positive, and 2 of 12 sera from cases of cirrhosis of the liver were positive.

Sera from cases of infectious mononucleosis were regularly positive; however, this condition is associated with clinical symptoms and laboratory signs of hepatitis. Positive reactions were obtained with a few sera from individuals with conditions not primarily involving the liver.

It was demonstrated that the appearance of a positive water precipitation test is not related to the absolute concentration of serum albumin, gamma globulin or (probably) beta globulin. Since the active substance is extractable with ether or alcohol-ether, it is believed that a positive reaction is caused by an imbalance in the serum lipids normally associated with the beta globulin complex.

Publication No. 935

Microfilm copy of complete manuscript 99 pages
at 1 1/4 cents, total cost \$1.24, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-65

PHYSICS

LOW FREQUENCY FLUCTUATION VOLTAGES IN VACUUM TUBES

Robert Worthington Bogle, Thesis (Ph.D.)
University of Michigan, 1948

Random voltage fluctuations of a non frequency dependent nature have long been recognized in vacuum tubes and accurately analysed by Schottky and others in terms of the discrete nature of the electron space conduction current. Agreement between theory and experiment for this effect is good if the frequency of measurement is greater than 10^4 cps. Below this frequency, there is to be found a dependence of "noise" on frequency, that is, with decreasing frequency, an increase of noise voltage is to be found, all variables other than frequency being held constant.

An introductory section treats the theoretical considerations concerning "shot" or frequency-independent noise under various tube conditions, as well as the low frequency, frequency-dependent "flicker" effect. Theory postulates cathode flicker effect generators which are spots of altered work function which exist for finite lifetimes. The extension of noise spectra to low frequencies has been carried out partly with a view to determining the average lifetime. Experiments with specially constructed wave analysers are described which extend the frequency spectra for a variety of tube types to 0.014 cps. No definite indication of a flattening of the spectra are to be found at this frequency or above.

Two subsidiary experiments are described which place estimates on the lifetime of the flicker effect for coated emitters at 30 minutes and for thoriated tungsten emitters at three minutes. One of these experiments demonstrates the actual flicker

mechanism, the results being presented as a series of timed photographs.

The power law by which mean square noise voltage is related to frequency for flicker effect is, for all tubes tested, close to -1.3 in frequency.

A circuit is described which reduces the high noise to signal ratio inherent in amplifiers used with low impedance generators at low frequencies such as bolometers and thermocouples used for infrared detectors.

Publication No. 962

Microfilm copy of complete manuscript 147 pages
at 1 1/4 cents, total cost \$1.84, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.

Library of Congress Card Number Mic A48-92

A STUDY OF THE ELASTIC PROPERTIES
OF VARIOUS SOLIDS BY MEANS OF
ULTRASONIC PULSE TECHNIQUES

Julian Ross Frederick, Thesis (Ph.D.)
University of Michigan, 1948

The elastic properties of various solid materials have been determined by observations of the velocities of propagation of pulses of transverse and longitudinal ultrasonic vibrations in those materials. In the most general case there are in any direction in a solid no more than three waves propagated. They correspond to one longitudinal and two transverse vibrations, each of which will have its own characteristic velocity. Simple relations exist between those velocities and the elastic constants c_{ij} of single crystals, and Young's modulus, the modulus of rigidity and Poisson's ratio of polycrystalline media.⁽¹⁾

The pulses were produced and detected by means of a device developed in this laboratory called the "ultrasonic reflectoscope".^(2,3) This instrument also served to measure the speed of the pulses by means of a system of synchronized microsecond time-markers superimposed on the sweep of the cathode-ray tube screen used for observation. The pulses varied in length from one to five microseconds. The ultrasonic frequencies used were between one and ten megacycles.

By utilization of special techniques the method was applied to the study of the variations of the elastic properties of solids over temperatures ranging from -320° F. (-195° C.) to 1650° F. (870° C.). These techniques involved heating or cooling only a portion of the test specimen, since the type of pulse source used has to be kept near room temperature. Only the velocities of the pulses in the heated or cooled regions were then measured. This

information permitted computation of the desired elastic constants.

The elastic constants c_{11} , c_{12} , and c_{44} of NaCl, KBr, and LiF were measured and the results are in agreement with those of other observers. The expressions for the elastic constants λ , μ , and c ($= \lambda + 2\mu$) of polycrystalline materials in terms of the single crystal constants c_{11} , c_{12} , and c_{44} are derived and shown to be

$$\lambda = \frac{1}{5} c_{11} + \frac{4}{5} c_{12} - \frac{2}{5} c_{44}$$

$$\mu = \frac{1}{5} c_{11} - \frac{1}{5} c_{12} + \frac{3}{5} c_{44}$$

$$c = \lambda + 2\mu = \frac{3}{5} c_{11} + \frac{2}{5} c_{12} + \frac{4}{5} c_{44}.$$

Substitution of published data on the constants of Al, Fe, Ag, and Cu gives calculated values that are in agreement with those observed experimentally by the pulse method.

Both static and ultrasonic pulse measurements of Young's modulus were made on the same samples of several metals at room temperature and the results are the same by both methods.

The elastic constants of twenty-eight steels of different composition as well as specimens of Al, Ni, Mo, Ag, Mg, commercial brass, Armco iron, several alloys, and lime glass were tested over wide temperature ranges. The moduli decrease linearly with increasing temperature except for the influence of magnetic effects, changes in structure, or for temperatures near the melting point. Magnetic effects produced anomalous behavior in both iron and nickel. In ferritic steels the rate of decrease of Young's modulus with increasing temperature is about twice as great just below the $\alpha \rightarrow \gamma$ transformation point as it is in the nearly linear region below 800° F. Nickel behaves in an opposite manner in its magnetic region. The rate at which the moduli decrease

becomes smaller as the Curie point is approached. Over the range of temperatures from 460° F. to 630° F. the moduli even increased slightly instead of decreasing. The change in steel from a body-centered to a face-centered structure is accompanied by a sharp decrease of about eight percent in the moduli. Changes in structure which take place during aging of metals were observed to increase the moduli by about three percent in the case of a special alloy of Fe, Cr, and Ni (Turbaloy), and of 24ST aluminum.

Besides having an anomalous elastic behavior nickel exhibited very high absorption of the ultrasonic vibrations below its Curie temperature but very low absorption above it.

All values of Poisson's ratio increased with increasing temperature except those of glass which decreased slightly. The values for the steels ranged from about 0.29 at room temperature to about 0.34 at 1500° F. Aluminum ranged from 0.35 at -320° F. to 0.38 at 700° F. The lime glass decreased from 0.22 to 0.20 on being heated from room temperature to 550° F.

- (1) Love, A. E. H., The Mathematical Theory of Elasticity. 4th Ed. (Dover, New York)(1944). Pp. 126, 297-300.
- (2) Firestone, F. A., J. Acoustical Soc. of Am., Vol. 17, pp. 287-299 (1946).
- (3) Firestone, F. A. and Frederick, J. R., J. Acoustical Soc. of Am., Vol. 18, pp. 200-211 (1946).

Publication No. 974

Microfilm copy of complete manuscript 139 pages
at 1 1/4 cents, total cost \$1.74, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-104

THE EFFECT OF NONLINEARITY AND FREQUENCY
DISTORTION ON THE AMPLITUDE DISTRIBUTION
FOR STATIONARY RANDOM PROCESSES

Philip S. Jastram, Thesis (Ph.D.)
University of Michigan, 1948

Recent theoretical studies by Kac and Siegert of the effect of frequency distortion on non-Gaussian amplitude distributions for stationary random processes, or "noise", have shown that if the non-Gaussian distribution is due to square-law rectification, then for certain rather general types of frequency distortion preceding and following the rectifier, the final distribution can be calculated. The object of this work was to obtain an experimental check on the results predicted by the theory, and to obtain, experimentally, distributions for the corresponding problem in which a linear rectifier replaces the quadratic rectifier. This case cannot as yet be calculated.

The experimental procedure was to pass noise consisting of a fluctuating electromotive force through electric circuits designed to satisfy the conditions of the problem. Specifically, these were a single-resonant circuit, the nonlinear circuit consisting of either the quadratic or linear rectifier, and a low-pass resistance capacitance filter. The amplitude density distributions under study were those of the low-frequency output of the nonlinear element. The criterion for frequency distortion is the ratio of the bandwidth of the single-tuned circuit to the cut-off frequency of the low-pass filter. Distributions were measured for various degrees of frequency distortion, from very slight to very large.

The measured distributions are displayed, for both the quadratic and linear rectifier, as families of curves plotted for various values of the bandwidth ratio.

Comparison of the theoretical with the measured distribution for one value of the bandwidth ratio of the quadratic case shows agreement of all parts of the distributions, within experimental error. Since for the ratio chosen the distribution is highly sensitive to the various parameters and is representative of the "intermediate distortion" condition, the result is taken to be a strong indication that the theory is correct.

The distributions for the linear rectifier show a less marked variation with the bandwidth ratio than those of the quadratic rectifier; for very great distortion, the distribution is found, as expected, to approach the Gaussian shape.

Publication No. 961

Microfilm copy of complete manuscript 102 pages
at 1 1/4 cents, total cost \$1.28, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-91

AN INVESTIGATION OF METHODS FOR MEASURING ABSORPTION COEFFICIENTS OF GAMMA RAYS

William Charles Parkinson, Thesis (Ph.D.)
University of Michigan, 1948

The mechanism of absorption of gamma rays in matter can be separated into three principal processes, the photoelectric effect, Compton scattering, and pair production. Of these, Compton scattering is predominant in the region from one to three mev. Many formulae have been deduced which predict the cross-section for the Compton process. The most notable of these, the Klein-Nishina formula, is based on the Dirac relativistic theory of the electron. As verification of the Klein-Nishina formula would constitute direct proof of the Dirac theory, fundamental in the study of primary particles, many experiments have been performed in an attempt to establish its validity. Although nearly all experiments were the same in principle, the results were inconsistent.

An investigation of methods of measuring the absorption coefficients in the range from one to three mev. was undertaken. Three methods have been investigated, each of which is designed to overcome the two main difficulties encountered, namely, the lack of mono-energetic sources, and the error introduced due to scattering. The principle of the first method is the same as that used by the earlier investigators. A more nearly mono-energetic beam of gamma rays is produced by passing the radiation through a lead filter. It is shown that, as the filter thickness is increased, the measured value of the absorption coefficient in aluminum approaches the value predicted by theory. The second method uses coincidence counters between which is

placed an aluminum filter that will just completely absorb the secondary electrons produced in the first counter by all but the highest energy gamma rays. In this way the effect of the lower energy lines is eliminated. The third method employs a beta ray spectrometer to separate the secondary electrons ejected from a target by the various energy gamma rays. Only those electrons ejected by the highest energy quanta are counted. In all three methods, scattering is minimized by the use of good geometry which is possible with the strong sources now available. A discussion is given of the inherent and statistical errors of the three methods. Drawings and photographs, as well as a description of the apparatus, are presented.

The investigation indicates that the first two methods are capable of yielding accurate results but, because of low counting rates, the spectrometer method is not satisfactory. Using the first two methods, measurements of the absorption coefficient in aluminum of the 1.72 mev. gamma rays from antimony 124 indicate agreement with the Klein-Nishina value of 0.124 cm.^{-1} within the probable error of 2%. The spectrometer method indicates a value, not corrected for scattering, of 0.131 cm.^{-1} , a discrepancy of 5%. This cannot be considered significantly different from the Klein-Nishina value, however, because scattering is difficult to assess.

Publication No. 958

Microfilm copy of complete manuscript 90 pages
at 1 1/4 cents, total cost \$1.13, paper
enlargements 6" x 8", at 10% per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-88

THE PROBLEM OF MEASURING THE ENERGY SPECTRUM OF
THE SYNCHROTRON BEAM, AND AN EXPERIMENTAL INVESTI-
GATION OF HIGH RESOLUTION COUNTING TECHNIQUES

Robert W. Pidd, Thesis (Ph.D.)
University of Michigan, 1948

An analysis is made of the problems of measuring the energy spectrum of a 300,000,000 volt synchrotron beam and the cross section for pair production with particular regard to counting errors. The analysis leads to the result that a strong experimental advantage is derived from an overall resolution time of 0.1 microseconds for the counter system.

Two types of detectors are advanced for their high resolution characteristics: the proportional counter and the Cherenkov counter. The rise time, recovery time, and delay time of the output pulses of these detectors are described. The presentation includes an experimental verification of a 0.2 microsecond recovery time for the proportional counter where the delay time is of the same order. It is proposed that the corresponding figure for the Cherenkov counter is .01 microsecond.

Circuit limitations in obtaining short resolving times are described with particular emphasis placed on pulse amplification, including the details of a 100 megacycle video amplifier.

Further developmental research is foreseen which will lead to counting systems whose resolving time is .01 microseconds where either the gas or Cherenkov counter is utilized.

Publication No. 957

Microfilm copy of complete manuscript 95 pages
at 1 1/4 cents, total cost \$1.19, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-87

PSYCHOLOGY

THE INTER-RELATIONS OF CONTRAST, AREA, AND ADAPTATION BRIGHTNESS IN HUMAN BINOCULAR VISION

H. Richard Blackwell, Thesis (Ph.D.)
University of Michigan, 1947

Experimental data are presented representing approximately 450,000 responses made by trained observers under laboratory conditions. Contrast thresholds were obtained with normal binocular vision for stimuli brighter and darker than their background, and for two values of stimulus exposure. In each case, wide variations were studied in the parameters: stimulus contrast, stimulus area, and adaptation brightness.

It was found that large stimuli darker than their background have lower contrast thresholds than corresponding stimuli brighter than their background, when the adaptation brightness level is low. A qualitative analysis indicated the likelihood that this phenomenon was caused by the existence of scattered light within the eye.

The experimental data were adjusted to eliminate the influence of variation in pupil size. Analysis revealed that the converted data for small stimuli exhibited good apparent agreement with the theoretical predictions of Hecht or Graham but that the data for large stimuli exhibited systematic discrepancies from either formulation. Even in the case where apparently good fit was obtained by theory it was shown that this resulted from the non-critical nature of the constants in the theoretical equations.

An attempt was made to evaluate the probable effect of ocular oscillations upon the contrast threshold. A tentative analysis revealed the possibility that a large part of the variation in threshold

contrast with other experimental parameters may be attributable to this factor. When approximate allowance was made for this effect, the data for large and small stimuli alike exhibit satisfactory apparent agreement with the theoretical predictions of Hecht or Graham.

Publication No. 934

Microfilm copy of complete manuscript 189 pages
at 1 1/4 cents, total cost \$2.37, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-64

SOCIOLOGY

THE HEALTH INSURANCE MOVEMENT IN THE UNITED STATES; A CASE STUDY OF THE ROLE OF CONFLICT IN THE DEVELOP- MENT AND SOLUTION OF A SOCIAL PROBLEM

Odin Waldemar Anderson, Thesis (Ph.D.)
University of Michigan, 1948

The dissertation is an attempt to analyse the role of conflict and conflict groups in the development and solution of a social problem expressed in a reform movement, health insurance, with particular reference to a profession, medicine, as the chief opposition group.

The approach is in the nature of an historical analysis of the emergence of a social movement over a period of thirty years from 1915 to the present and of the behavior of the medical profession in relation to this movement. The framework within which the social movement and the conflicts are analyzed is constructed around the following concepts: (1) social problem, (2) social movement, (3) conflict, (4) reform, and (5) profession.

Health insurance offers one dominant social reform idea--spreading the economic risk of illness. This reform idea stimulates certain persons and groups to behave in certain ways. The idea seems to start at the top of the intellectual ladder with economists, social workers, sociologists, and related groups. From them comes the beginning of agitation in response to discrepancies they see between the actual and the potential utilization of health services and to the crushing burdens of the costs of health care suffered by individuals and families during a given period of time. As the reform idea gains recognition, either for or against, more and more groups are stimulated to some kind and degree of action. Conflicts aroused by the idea highlight the issues and set the movement in motion

in the sense that certain issues are settled or at least superseded which in time lay the groundwork for issues at a higher level until the movement culminates in some kind of solution to the problem.

The health insurance movement in the United States is divided into three periods. The first period from 1915 to 1920 witnessed a great deal of activity leading to legislation in many states, but there was lacking a broad base of support and the movement subsided. The second period from 1921 to 1932 represented a truce after the opposing forces had spent themselves. The only activity taking place was of an investigational nature. The third period beginning in 1933 and which has not yet ended represents another crescendo of agitation leading to legislation and voluntary health insurance plans. The opposing forces are centered in organized labor which is in favor of compulsory health insurance and in organized medicine which is in opposition.

After the development of the health insurance movement is presented, the structure and ideals of the medical profession conditioning its opposition to compulsory health insurance are examined. Finally, two types of conflicting groups are distilled from the development of the health insurance movement, the medical mind and the social reformer mind. Attempts are made to show the areas of agreement between these types which keep them within sparring distance of each other and condition their conflicts in the areas of disagreement.

Publication No. 959

Microfilm copy of complete manuscript 277 pages
at 1 1/4 cents, total cost \$3.47, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-89

THE FACTORS IN OCCUPATIONAL
SELECTION AMONG DETROIT JEWS

S. Joseph Fauman, Thesis (Ph.D.)
University of Michigan, 1948

This study is an analysis of the causal factors affecting the occupational class distributions of Jewish and non-Jewish youths in Detroit. The specific hypothesis of this study is that: the occupational class distributions of Jewish and non-Jewish youths in Detroit differ because of differences between the Jewish group and the non-Jewish group in occupation of father, income of family, education of son, and industry of son. The subsidiary hypothesis tested here is that: the differences in the factors which are causally related to the occupational class distributions of Jewish and non-Jewish youth are the result of different environmental pressures facing Jews and non-Jews. The factors studied are divided into two groups: occupation of father and income of family represent the relatively fixed environmental factors affecting the occupational choices of youth; while the factors of education of son and industry of son represent the relatively voluntary response of youth, in terms of the values of the group, to the problem of occupational choice.

A sample, consisting of 750 Jewish sons and fathers and 7321 non-Jewish sons and fathers, was drawn from the schedules of the Michigan Census of Population and Unemployment of 1935. These data for Detroit were tabulated by religious groups as to occupation of son and the other four factors which were studied. The data for Jewish and non-Jewish sons were then compared by the technique of standardization as used in demographic analysis.

The results show that when the factors studied were controlled the occupational class distributions of Jewish and non-Jewish sons became the same. The factors of occupation of father and income of family were found to have much less influence upon the occupations of sons than the factors of industry of son and education of son. It was further demonstrated that the occupation of father and the income of family did not materially affect the education and industry of sons.

It was concluded that the group-oriented voluntary responses of sons, as indicated by their education and industry, were the major factors which affected the occupational class distribution of Jewish sons. The interpretation of the nature and significance of education of son and industry of son indicated that these factors reflect the value orientations of the Jewish group. It is pointed out that the Jewish community places high value upon the educated person for historical reasons. Since at the same time the Jewish group evidences an expectation of the discrimination historically practiced upon it and therefor evaluates very highly the independence of particular occupations, these values were discussed in detail. It is tentatively concluded that the value orientations of the Jewish community have produced the differential occupational distribution of Jewish and non-Jewish sons in Detroit.

Publication No. 954

Microfilm copy of complete manuscript 180 pages
at 1 1/4 cents, total cost \$2.25, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-84

A COMPARATIVE STUDY OF CERTAIN HOMELESS
AND UNATTACHED DOMICILED MEN

Boris M. Levinson, Thesis (Ph.D.)
New York University, 1947

Traditionally, destitute unattached men have been cared for in congregate shelters. In 1934, New York City took the forward step of granting assistance to unattached domiciled men in their homes. The purpose of this study was to ascertain if there are any significant differences between homeless and unattached domiciled men receiving Public Assistance in New York City. The findings were evaluated and specific recommendations made for promoting the rehabilitation of these men.

The following factors were presented, analyzed, and discussed for both groups: relief history, medical findings, criminal records, socio-economic background, home environment, home adjustment, reasons for separation from family and becoming unattached, social and sexual adjustment, activities and interests, attitude toward Public Assistance, intelligence, mental deterioration, psychometric patterns, neuropsychiatric disabilities, and personality traits. Case histories illustrative of homeless and domiciled men were presented.

The subjects of this study were one hundred white, unattached men, aged 40 through 59, in receipt of Public Assistance in New York City. Fifty were chosen at random from the caseload of a Welfare Center in New York City and fifty persons were chosen at random from homeless men in receipt of shelter care at the Municipal Lodging House.

The method of study of group differences consisted in a comparative analysis of (a) the performance of the two groups on the Wechsler-Bellevue Scale and the Cornell Selectee Index, (b) the

appraisal by the case worker of the personality traits of unattached men, (c) case records, (d) medical data, (e) interviews, (f) case histories of homeless and domiciled men. Critical ratios of 2.00 to 2.99 were considered fairly significant and critical ratios of 3.00, and over were considered significant.

The findings of the study indicate that both groups are, to a great extent, ill and unemployable. The homeless group have a significantly greater number of men who were native born, were happy at home, became unattached because of the type of employment in which they engaged, and who have been arrested. The domiciled group has a significantly greater number of men who were foreign born, were unhappy at home, and became unattached through immigration. There were no significant differences found in the sexual and social adjustment of the two groups. Lack of constructive free time activity was characteristic of both groups. Significantly more homeless men find something worth while in shelter care, than do domiciled men in home relief. The homeless group, on the average, is brighter than the domiciled group, as a whole. However, there are no statistically reliable differences between the intelligence of the native born homeless and native born unattached domiciled men. In intelligence, the unattached native born men approach the mean for the general population. More homeless men show mental deterioration than do domiciled men. The psychometric patterns of the homeless and domiciled men differ from each other and from the norms for the general population. Fifty-eight per cent of the homeless men and 56 per cent of the domiciled men have neuropsychiatric disabilities. Thirty-six per cent of the homeless men and 34 per cent of the domiciled men have schizoid personalities.

Although these significant differences exist, there is also a wide range as well as a great overlapping of all traits. None of the differences found

indicate that the homeless men, as a group, are less able to manage on a cash grant than domiciled men, as a group. There are individuals in both groups who, because of social, personality, or health factors find it difficult to manage by themselves. Only a careful study of the needs of these men can determine the type of care most suited to the group or to the individual. The policy for the Department of Welfare in differentiating care given to unattached men on the basis of possession of a domicile is not valid in the light of the findings of this study.

Recommendations are made for changes in the welfare program for unattached men. Among these are: an attempt to redirect the energy of the client into activities satisfactory to himself, a counseling clinic to help men who find it difficult to adjust to living on Public Assistance, some arrangement for those clients who cannot or do not want to care for themselves.

The student hereby guarantees that no part of the dissertation or document which he has submitted for publication has been heretofore published and (or) copyrighted in the United States of America, except in the case of passages quoted from other published sources; that he is the sole author and proprietor of said dissertation or document; that the dissertation or document contains no matter which, if published, will be libelous or otherwise injurious, or infringe in any way the copyright of any other party; and that he will defend, indemnify and hold harmless New York University against all suits and proceedings which may be brought and against all claims which may be made against New York University by reason of the publication of said dissertation or document.

Publication No. 943

Microfilm copy of complete manuscript 284 pages
at 1 1/4 cents, total cost \$3.55, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-73

ZOOLOGY

THE DEVELOPMENT OF THE ENTOMOLOGICAL EXHIBIT IN MUSEUMS OF THE UNITED STATES

Lucy W. Clausen, Thesis (Ph.D.)
New York University, 1947

The purpose of this study was to trace the historical development of the entomological exhibit in museums of natural history in the United States: how the entomological exhibit originally came into use; how it has been utilized as a display medium for both formal and informal public education; to trace the sequential relation of significant contributions to the entomological exhibit as it is accepted and used today, and to report the possibilities for further extension of display techniques in this field.

Source material for this study consisted principally of actual entomological exhibits in use in museums, answers received to the investigator's questionnaire on entomological exhibits and data pertinent thereto, and such data relative to the subject as has been written or printed. Photographs of actual exhibits as they were on public view were taken by the investigator in order to illustrate more clearly the exhibits under discussion. Forty-five of the one hundred and twenty-eight photographic records thus made were selected and used in this dissertation.

For the purpose of this study the term entomological exhibit was broadened to include exhibits of closely allied specimens, such as spiders, ticks, mites, scorpions, and centipedes, which technically are not true insects.

The entomological exhibit as found in the museums of natural history in the United States varies greatly. Specimens may be shown as individual insects, they may be arranged in synoptic series to bring out their sequential relationships, they may

be limited to the bizarre or unusual forms, or they may be used to tell the story the individual museum wishes to tell. Sometimes but a single type of exhibit is to be found in a given museum, while in others, several types may be found. Various existing conditions of a local nature enter into the question of what types of insect exhibits a museum will use.

The study of entomology, once considered a trivial pursuit, has become recognized as an essential study connected with human welfare. The exhibits of the early museums were set up with a relatively homogeneous group of people in mind - the lay benefactors of the institution whose education and public-spirited interest made the existence of these exhibits possible. Today, however, the scene has changed so that the object of an exhibit is aimed at the entire heterogeneous community. This study gives evidence that in order to meet the changing needs of the community the persons responsible for setting up museum exhibits should have objective knowledge of the effect such educational efforts will have upon museum visitors. The natural history museum is the logical place for the public to find comprehensive information on insects, yet insect exhibition techniques have not kept pace with the progress of exhibition techniques in some of the other branches of science, primarily because they have not received as much consideration and attention. If insect preparators had been available as long as preparators in other fields of science, the art of entomological exhibition doubtless would have progressed further than it has. It is obviously impractical to expect scientists on the scientific staff of an insect department, trained especially in scientific identification, to create exhibits which could be attractive and educationally informative.

Stressed throughout this dissertation is the public's confidence in expecting to find the truth in the natural history museum and the necessity for

presenting the truth adequately, interestingly, and within the intellectual grasp of the average non-scientifically trained museum visitor.

Publication No. 937

Microfilm copy of complete manuscript 173 pages
at 1 1/4 cents, total cost \$2.17, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-67

ARBOREAL ADAPTATIONS OF PEROMYSCUS, WITH
SPECIAL REFERENCE TO THE USE OF THE TAIL

B. Elizabeth Horner, Thesis (Ph.D.)
University of Michigan, 1948

A laboratory investigation was conducted of the climbing behavior and ability of mice of the genus *Peromyscus* belonging to ten forms, five of which were subspecies of the species maniculatus. Of the forms studied, gracilis, oreas, noveboracensis, nasutus, and truei are known to be semi-arboreal in their natural habitats; while bairdii, blandus, nebrascensis, and leucocephalus live in grasslands or deserts, where trees are largely absent. The stock of mice assigned to rubidus came from Hood River, Oregon, where it occupies a type of habitat intermediate between forest and open field.

The semi-arboreal forms differ from the terrestrial forms, in general, in having longer tails and longer hind feet, characteristics which can be assumed to be adaptations for arboreal life. Special attention was given in this study to testing the effectiveness of tail length as an adaptation to arboreal habit.

The semi-arboreal and terrestrial forms were found to differ in general behavior, the former being less nervous and more at ease on elevated branches and platforms. The semi-arboreal forms showed also greater awareness of their elevated positions.

Although all ten of the forms studied climbed spontaneously when the apparatus offered was sufficiently easy to climb and when the animals were allowed time to explore freely, the semi-arboreal forms showed significantly greater ability than the terrestrial forms to climb natural and artificial tree trunks of several degrees of smoothness and

diameter. The semi-arboreal forms were able also to reach and to jump greater distances than were the terrestrial forms, although spontaneous jumping from branch to branch was of infrequent occurrence. The over-all performance of rubidus was in harmony with the intermediate type of natural habitat of this stock.

In climbing horizontally along artificial branches, the semi-arboreal forms were, in general, significantly more proficient than the terrestrial forms, a large part of the greater proficiency of the semi-arboreal forms being due to their longer tails. Amputation of the tail seriously handicapped the arboreal proficiency of all of the mice, the resultant handicap being greater for the long-tailed than the short-tailed forms. Measurement of the proficiency of the long-tailed, semi-arboreal gracilis in climbing along small branches showed these mice to make twice as many errors in performance when deprived of their tails as when their tails were intact. The shorter-tailed, terrestrial forms nebrascensis and leucocephalus, on the other hand, increased their climbing errors only one and one-half times when deprived of their tails. The adaptive advantage of the long tail of the semi-arboreal forms of *Peromyscus* was manifested not only in its greater effectiveness as a balancing organ, but also in its greater use in prehension, as a tactile organ, and as a prop.

It is concluded that the semi-arboreal forms are better adapted to scansorial habits than the terrestrial forms by virtue of their longer tails and their general reactions to elevated situations. In mice of the genus *Peromyscus*, therefore, adaptation for arboreal life includes modifications both of body proportions and of behavior.

Publication No. 951

Microfilm copy of complete manuscript 182 pages
at 1 1/4 cents, total cost \$2.28, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-81

THE TIME INTERVAL BETWEEN DETERMINATION AND
DIFFERENTIATION OF WINGS AND ASSOCIATED
STRUCTURES IN THE APHID MACROSIPHUM SANBORNI
(GILLETTE)

James B. Kitzmiller, Thesis (Ph.D.)
University of Michigan, 1948

Approximately 10,000 chrysanthemum aphids (Macrosiphum sanborni) were studied in an investigation of the time interval between embryonic determination and visible differentiation of wings, ocelli and wing muscles.

It was known that low temperatures (ca. 18 degrees C.) and continuous light promoted the development of wings in this species, and that continuous darkness and temperatures above 20 degrees C. restricted wings. Using these data, experiments were carried on in which wingless parthenogenetic females were allowed to produce offspring in both sets of conditions. From the calculation of the average time at which wings were lost in the wing-inhibiting conditions, the time of determination of wings was found to be 3.77 days before birth of the aphids.

Differentiation of wings is first evidenced by the appearance of paired thickenings of the hypodermis in the thoracic region. These thickenings are found in unborn embryos; therefore initial differentiation of wings takes place before birth. Using a calculation involving the time of appearance of eye pigment in the ommatidia, it was determined that wings are differentiated about one day before birth. The time interval between determination and differentiation of wings is thus about two and three-quarter days.

Ocelli and wing muscles are found exclusively in winged individuals of this species. It is probable, therefore, that they are determined at the

same time as wings. Ocelli are differentiated about two and one-half days after birth, and wing muscles about one and three-quarter days after birth. The time interval between determination and differentiation is therefore computed to be about 6.25 days for ocelli and 5.5 days for wing muscles. These data are not as reliable, however, as for wings, since the exact time of determination cannot be accurately fixed.

A satisfactory technique for aphid histology is presented. The principal feature of this method is the use of dioxane as a dehydrating agent, eliminating the alcohols and xylol. Tissues are fixed in Bouin's, placed directly into dioxane, then into tissuemat. Good sections were obtained with a minimum of tearing or breaking of the exoskeleton.

Certain data on the life cycle were recorded. The length of a generation, from birth to production of first offspring, was found to be about ten days. This varied only slightly in the different sets of conditions. The birth rate (young per female per day) was found to be 0.953 at 18 degrees C., light, and 1.295 at 20 degrees C., dark. When females were left in the dark for more than ten days, production of offspring dropped sharply. The mean lengths in hours of the four nymphal instars are as follows: first, 56.8; second, 39.9; third, 34.1; fourth, 44.7. The mean number of hours from birth to successive moults is as follows: first, 56.8; second, 96.1; third, 124.8; fourth, 169.5. Wings are visible externally in the late second or early third instar.

The possible action of a hypothetical protein-like substance, perhaps produced by the mycetom, is suggested as an explanation of the data on wing production.

Publication No. 947

Microfilm copy of complete manuscript 80 pages
at 1 1/4 cents, total cost \$1.00, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-77

THE MECHANICS OF ENVIRONMENTAL CONTROL
OF BODY FORM IN FISHES

William Robert Martin, Thesis (Ph.D.)
University of Michigan, 1948

The relative-growth method is used to investigate the mechanics of the environmental control of body form in fishes. This effect of the environment in modifying body form has been repeatedly shown by the relationship of the relative size of body parts to either rate of early development or subsequent growth rate.

The relative growth of any body part such as head is described by a series of relative-growth stanzas differing in slope and in the size range over which each is applicable. Five stanzas are described for the salmon during the life of the fish. The four inflections delimiting these stanzas occur approximately coincident with the attainment of the eyed-egg stage, hatching, ossification and sexual maturity, respectively. Inflections are demonstrated in more than twenty species of fishes.

Differences in the body form of individuals, groups or populations of one species are regularly found at both small and large sizes. The relative-growth lines describing such differences are often approximately parallel. This demonstration of parallelism is indirect evidence that inflections, particularly during early development, are important in the control of body form. Direct evidence of the role of inflection in the determination of body form is found in natural populations and experimental lots of rainbow and brook trout. Differences in body proportions of certain mature trout populations were found to be largely dependent on fish size at the sexual-maturity inflection. Body-form differences in small trout were produced by

controlling temperature during early development. Rainbow trout reared at 46°F to 20 mm. standard length and then 60°F had a higher growth rate, larger size at the subsequent inflection and larger heads and fins after inflection than did fish reared at 46°F throughout the experiment. Very early inflections, as well as those at about 30 mm. and at sexual maturity, are probably important in the determination of body form.

The fast-growing individuals of a group have relatively small body parts such as head and fins but a fast-growing group of individuals may have relatively small or relatively large body parts. The relative size of body parts is determined to a large degree by the direction of, degree of and body size at inflections. Rate of early development and subsequent growth rate may affect body form through their influence on body size at inflection.

The slope of relative-growth lines was altered experimentally by malnutrition. Relatively large head parts resulted.

Differences in the length-weight relationship, found within species, are in part attributable to variation in fish size at growth inflection.

Body size at inflection plays a part in the determination of body form in animals other than fishes.

Publication No. 955

Microfilm copy of complete manuscript 172 pages
at 1 1/4 cents, total cost \$2.15, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-85

DISTRIBUTION AND RELATIONSHIPS OF
THE SNAKES OF THE GENUS LEPTOPHIS

James Arthur Oliver, Thesis (Ph.D.)
University of Michigan, 1941

Oliver, James A./ Distribution and Relationships of the Snakes of the Genus Leptophis./ A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the University of Michigan./ pp. 1-198, pls. 1-12, 1 fig. 1941.--A revisionary study of the genus Leptophis has been made on the basis of all the available specimens in the collections of the museums in the United States and in some of the South American museums. The genus is composed of eleven species, including a total of eighteen named forms. Six of the eighteen forms recognized were not named prior to this study. The genus occurs in the warm, relatively humid lowlands of the mainland of Latin America from northern Mexico to northern Argentina. The members of the genus are semi-arboreal or arboreal inhabitants of the forested areas: the tropical and subtropical rain-forest, the tropical deciduous forest, and the scrub forests of the Neotropical Realm. They are oviparous, and feed principally on frogs of the family Hylidae. The genus is a part of the Old Northern colubrine stock that has entered Middle and South America from the north and undergone subsequent evolution in these areas. It appears to be most closely related to the genera Drymobius and Dryadophis which are also inhabitants of the neotropical regions. Leptophis probably originated in lower Central America, from which area it has spread northward into upper Central America and southward into virtually all of the warm, humid lowland forest areas of South America.

Publication No. 966
Microfilm copy of complete manuscript 214 pages
at 1 1/4 cents, total cost \$2.68, paper
enlargements 6" x 8", at 10¢ per page. Available
from University Microfilms, Ann Arbor, Mich.
Library of Congress Card Number Mic A48-96

Part II

CUMULATIVE INDEX

CUMULATIVE INDEX OF TITLES

Listed below are the titles of all doctoral dissertations available on microfilm, excepting those abstracted in this booklet, which have been published since the appearance of Volume 7, No. 2 of MICROFILM ABSTRACTS (Dec. 1947). Abstracts of the following dissertations have been published in MICROFILM ABSTRACTS and in special volumes prepared for Pennsylvania State College and Colorado State College of Education. All may be identified by the letters and date following the reference.

(M.A....) Microfilm Abstracts, University Microfilm, Ann Arbor, Michigan.

(P.S....) Abstracts of Doctoral Dissertations. Pennsylvania State College, State College, Pennsylvania.

(C.S....) Abstracts of Field Studies for Degree of Doctor of Education, Colorado State College of Education, Greeley, Colorado.

Positive microfilm copies of the complete manuscript of any of these titles may be had at 1 1/4¢ per page, or paper enlargements, 8 1/2 x 11 inches accommodating two pages each, at 10¢ per page, from University Microfilms, Ann Arbor, Michigan. Order should be made by "Publication Number," and Title.

ART

Later Corinthian pottery. Mary Thorne Campbell, Ph.D. Thesis; Bryn Mawr College, 1941. pp. 234, Pub. No. 797, (M.A. 1946, Vol. VII, No. 1).

Ionic chiton-clad maidens of the fifth century. Cleta Olmstead Robbins, Ph.D. Thesis; Bryn Mawr College, 1942. pp. 239, Pub. No. 835, (M.A. 1947, Vol. VII, No. 2).

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Preparation, purification and refractive index determinations of the methyl, propyl and isopropyl esters of some saturated fatty acids. George William Hunter, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 94, Pub. No. 915, (P.S. 1946, Vol. IX).

The relation of molecular size and chemical constitution of saturated petroleum fractions to their insecticidal efficiency. George W. Pearce, Ph.D. Thesis; Pennsylvania State College, 1946, pp. 140, Pub. No. 899, (P.S. 1946, Vol. IX).

The effect of certain micronutrient elements on the growth and yield of pineapple plants. Francisco J. Ramirez-Silva, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 76, Pub. No. 900, (P.S. 1946, Vol. IX).

BACTERIOLOGY

Studies in bacterial nutrition with special reference to *Clostridium Sordellii*. Henry Dirk Piersma, Ph.D. Thesis; Purdue University, 1941. pp. 129, Pub. No. 840, (M.A. 1947, Vol. VII, No. 2).

BIOGRAPHY, CLASSICAL

The Heraklids. Jessie Winifred Alston, Ph.D. Thesis; Bryn Mawr College, 1941. pp. 236, Pub. No. 887, (M.A. 1947, Vol. VII, No. 2).

BIOLOGICAL CHEMISTRY

The hydrolysis of casein by enzymes with especial reference to the distribution of amino acids in the hydrolysate. John Beck, Ph.D. Thesis; Purdue University, 1937. pp. 98, Pub. No. 859, (M.A. 1947, Vol. VII, No. 2).

A study of the fat composition and firmness of pork under various dietary conditions. Winfred Quentin Braun, Ph.D. Thesis; Purdue University, 1942. pp. 55, Pub. No. 849, (M.A. 1947, Vol. VII, No. 2).

BIOLOGICAL CHEMISTRY

Metabolism of creatine. Alice Watson Kramer, Ph.D. Thesis; Purdue University, 1935. pp. 44, Pub. No. 853, (M.A. 1947, Vol. VII, No. 2).

The formation of glycogen in the liver of the white rat following the administration of certain synthetic organic acids. Mary Louise Lyons, Ph.D. Thesis; Purdue University, 1941. pp. 83, Pub. No. 863, (M.A. 1947, Vol. VII, No. 2).

The influence of structural configuration on the deamination of amino acids in the normal rat. Morris Franklin Milligan, Ph.D. Thesis; Purdue University, 1942. pp. 52, Pub. No. 848, (M.A. 1947, Vol. VII, No. 2).

The influence of certain dietary factors on the production of dental caries in a susceptible strain of rats. Kenneth Jean Olson, Ph.D. Thesis; Michigan State College, 1947. pp. 51, Pub. No. 916, (M.A. 1947, Vol. VII, No. 2).

The effects of various sources of vitamin D and dihydrotachysterol on the blood calcium and phosphorus levels in cows, dogs, chickens, and rats. Benjamin Hartley Pringle, Ph.D. Thesis; Michigan State College, 1947. pp. 124, Pub. No. 917, (M.A. 1947, Vol. VII, No. 2).

The enzymatic dephosphorylation of ribonucleic acid. A study of soy bean nucleases. Max Schlamowitz, Ph.D. Thesis; University of Michigan, 1946. pp. 160, Pub. No. 798, (M.A. 1946, Vol. VII, No. 1).

Catabolism of fatty acids. John T. Tripp, Ph.D. Thesis; Purdue University, 1936. pp. 52, Pub. No. 844, (M.A. 1947, Vol. VII, No. 2).

The availability to the rat of certain carotenes in raw and cooked vegetables. Marion A. Wharton, Ph.D. Thesis; Michigan State College, 1947. pp. 59, Pub. No. 888, (M.A. 1947, Vol. VII, No. 2).

The synthesis and intermediary metabolism of some sulfur analogues of cystine: Isocysteine. William

BIOLOGICAL CHEMISTRY

J. Wingo, Ph.D. Thesis; University of Michigan, 1946. pp. 121, Pub. No. 813, (M.A. 1946, Vol. VII, No. 1)

A study of the factors influencing the release of lead from the tissues of the mouse. Grant Saunders Winn, Ph.D. Thesis; Purdue University, 1940. pp. 130, Pub. No. 854, (M.A. 1947, Vol. VII, No. 2).

BIOLOGY

Factors affecting the respiration of isolated tissue. Carl McGee Meadows, Ph.D. Thesis; Purdue University, 1941. pp. 74, Pub. No. 861, (M.A. 1947, Vol. VII, No. 2).

BOTANY

Effect of nutrition on the reaction of cereals to leaf rust. Kenneth Davis Doak, Ph.D. Thesis; Purdue University, 1931. pp. 195, Pub. No. 843, (M.A. 1947, Vol. VII, No. 2).

"White-heads" of grasses. Harry Louis Keil, Ph.D. Thesis; Pennsylvania State, 1946. pp. 39, Pub. No. 895, (P.S. 1946, Vol. IX).

The action of allelic forms of the gene A_1 in maize. John R. Laughnan, Ph.D. Thesis; University of Missouri, 1946. pp. 113, Pub. No. 809, (M.A. 1946, Vol. VII, No. 1).

Aerobic decomposition of cellulose by micro-organisms at temperatures above 40° C. Elwyn T. Reese, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 116, Pub. No. 902, (P.S. 1946, Vol. IX).

Mineral absorption and resistance to wildfire in tobacco. Paul Sacco, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 105, Pub. No. 901, (P.S. 1946, Vol. IX).

CHEMICAL ENGINEERING

A. The effect of composition on the oxidation of hydrocarbon oils. B. The catalytic oxidation of

CHEMICAL ENGINEERING

Pennsylvania neutral oils. Neal Devere Lawson, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 198, Pub. No. 896, (P.S. 1946, Vol. IX).

Some calculations of multicomponent separations. Harold S. Ray, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 436, Pub. No. 903, (P.S. 1946, Vol. IX).

CHEMISTRY

The production of drying oils by the chlorination and dehydrochlorination of high molecular weight hydrocarbons. Leland Kenneth Beach, Ph.D. Thesis; Purdue University, 1940. pp. 162, Pub. No. 847, (M.A. 1947, Vol. VII, No. 2).

The measurement of the heat capacities of 1-nitropropane and nitroethane. G. Victor Beard, Ph.D. Thesis; Purdue University, 1940. pp. 34, Pub. No. 867, (M.A. 1947, Vol. VII, No. 2).

The animation of heterocyclic compounds. Lloyd Berg, Ph.D. Thesis; Purdue University, 1942. pp. 66, Pub. No. 846, (M.A. 1947, Vol. VII, No. 2).

I. Organofluorosilanes. II. Experiments in fluorocarbon chemistry. Thomas Jacob Brice, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 89, Pub. No. 913, (P.S. 1946, Vol. IX).

The determination of calcium as oxalate by the use of urea and formic-formate buffer. Frank S. Chan, Sc.D. Thesis; University of Michigan, 1933. pp. 153, Pub. No. 799, (M.A. 1946, Vol. VII, No. 1).

Synthetic antimalarials. Edward A. Conroy, Jr., Ph.D. Thesis; Pennsylvania State College, 1946. pp. 108, Pub. No. 914, (P.S. 1946, Vol. IX).

Preparation and properties of wetting agents from kerosene. Duncan James Crowley, Ph.D., Thesis; Purdue University, 1940. pp. 134, Pub. No. 866, (M.A. 1947, Vol. VII, No. 2).

CHEMISTRY

I. The heat capacity and entropy, heats of fusion and vaporization and the vapor pressures of butene-1. The zero point entropy of the glass. The entropy of the gas from molecular data. II. The heat capacity and entropy, heats of transition, fusion and vaporization and the vapor pressures. Evidence for a non-planar structure of cyclopentane. III. Equilibrium in the system oxygen-nitrogen-argon. Herman L. Fink, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 96, Pub. No. 892, (P.S. 1946, Vol. IX).

I. The effect of cyclization on physical properties of C_{14} hydrocarbons. II. The entropy of 11-n-decylheneicosane. III. A constant heat conduction melting point calorimeter. Fred B. Fischl, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 187, Pub. No. 911, (P.S. 1946, Vol. IX).

The pyrolysis of sodium salts of alpha-substituted acids. Duane L. Green, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 111, Pub. No. 779, (P.S. 1945, Vol. VIII).

I. Polymerization of tetramethylethylene. II. The vapor phase catalytic isomerization of dimethylaniline. III. The use of active carbon in the recovery of penicillin. Homer Huston Haggard, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 164, Pub. No. 912, (P.S. 1946, Vol. IX).

Alkylations by alkanes in the presence of sulfuric acid. John Meacham Hunt, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 210, Pub. No. 904, (P.S. 1946, Vol. IX).

I. The synthesis of halogen compounds of pentaerythritol. II. The zinc reduction of pentaerythrityl tetrabromide. III. The synthesis of cyclobutanone. Carl Peter Krimmel, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 163, Pub. No. 780, (P.S. 1945, Vol. VIII).

The viscosity of quasi-ideal mixtures and the ideal law of mixtures for viscosity. Herbert Sidell Lecky,

Ph.D., Thesis; Purdue University, 1941. pp. 36, Pub. No. 862, (M.A. 1947, Vol. VII, No. 2).

The high pressure, moderate temperature, liquid phase oxidation of some aromatic, alicyclic, and aliphatic compounds with pure oxygen in a medium of anhydrous hydrogen fluoride. Richard Edward McArthur, Ph.D. Thesis; Pennsylvania State College, 1941. pp. 97, Pub. No. 894, (P.S. 1946, Vol. IX).

I. A helium liquefier-calorimeter for heat capacities from 2-20°K. II. An analysis of the precision and accuracy of calorimeter C. III. The thermodynamic properties of hexafluoroethane. IV. The Raman spectrum of hexafluoroethane. Eugene Leonard Pace, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 85, Pub. No. 898, (P.S. 1946, Vol. IX).

The effect of various factors upon the structure and appearance of electrodeposited zinc. George Perkins, Ph.D. Thesis; Purdue University, 1940. pp. 157, Pub. No. 856, (M.A. 1947, Vol. VII, No. 2).

Chlorination of certain aliphatic acids and their derivatives. John Frederick Quinn, Ph.D. Thesis; Purdue University, 1942. pp. 85, Pub. No. 872, (M.A. 1947, Vol. VII, No. 2).

Hydrogenolysis of pentose sugars. John Robert Roach, Ph.D. Thesis; Purdue University, 1942. pp. 57, Pub. No. 850, (M.A. 1947, Vol. VII, No. 2).

I. The effect of cyclization on physical properties in the C₁₄ range. II. The effect of the anthracene system on physical properties. III. Miscellaneous. Anton William Rytina, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 207, Pub. No. 781, (P.S. 1945, Vol. VIII).

I. Mixtures of higher hydrocarbons. II. Generation of hydrogen bromide and preparation of alkyl bromides III. The synthesis and properties of heavy hydrocarbons. IV. Modification of the Wolff-Kishner reaction. Robert W. Schiessler, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 189, Pub. No. 782, (P.S. 1945, Vol. VIII).

CHEMISTRY

Hexaarylethanes containing the furan nucleus. David Richard Smith, Ph.D. Thesis; University of Missouri, 1945. pp. 121, Pub. No. 817, (M.A. 1946, Vol. VII, No. 1).

I. The alpha silicon effect. II. The beta and gamma silicon effects. Beta and gamma fission. Leo Harry Sommer, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 164, Pub. No. 783, (P.S. 1945, Vol. VIII).

Alkyl sulfates from paraffins of twelve to eighteen carbon atoms. Barney Ralph Strickland, Ph.D. Thesis; Purdue University, 1939. pp. 110, Pub. No. 851, (M.A. 1947, Vol. VII, No. 2).

Synthetic antimalarials. Robert B. Taylor, Jr., Ph.D. Thesis; Pennsylvania State College, 1945. pp. 153, Pub. No. 784, (P.S. 1945, Vol. VIII).

The scattering of low-velocity hydrogen ions in ethylene and propylene. Lloyd C. Unger, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 78, Pub. No. 785, (P.S. 1945, Vol. VIII).

I. Synthesis and properties of C₂₅ hydrocarbons and related mixtures. II. Use of sodium bisulfite in purification of penicillin. Charles Arthur Weisel, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 248, Pub. No. 906, (P.S. 1946, Vol. IX).

Rearrangements of the bicyclic terpenes. Joseph D. C. Wilson, II, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 87, Pub. No. 787, (P.S. 1945, Vol. VIII).

The synthesis and attempted rearrangement of compounds containing an allyl group attached to a three carbon system. Mary Elizabeth Wright, Ph.D. Thesis; Bryn Mawr College, 1943. pp. 64, Pub. No. 806, (M.A. 1946, Vol. VII, No. 1).

ECONOMICS

Broadcast songs - a paradox in monopoly control. Betty Bock, Ph.D. Thesis; Bryn Mawr College, 1942. pp. 97, Pub. No. 808, (M.A. 1946, Vol. VII, No. 1).

ECONOMICS

A course of study in interpretative accounting. Edward I. Crawford, Ed.D. Thesis; New York University, 1946. pp. 346, Pub. No. 837, (M.A. 1947, Vol. VII, No. 2).

The evolution, organization, and management of business. James Gemmell, Ed.D. Thesis; New York University, 1946. pp. 523, Pub. No. 831, (M.A. 1947, Vol. VII, No. 2).

Measurement of changes in the standard of living during a depression. Leslie Alice Koempel, Ph.D. Thesis; Bryn Mawr College, 1937. pp. 222, Pub. No. 807, (M.A. 1946, Vol. VII, No. 1).

Management problems and procedures of a manufacturing enterprise, 1802-1852; a case study of the origin of the Scovill Manufacturing Company. Theodore F. Marburg, Ph.D. Thesis; Clark University, 1942. pp. 664, Pub. No. 773, (M.A. 1946, Vol. VII, No. 1).

The Mississippi Federated Cooperatives (AAL) its organization, functions and accomplishments. Ralph Lemuel Sackett, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 301, Pub. No. 786, (P.S. 1945, Vol. VIII).

EDUCATION

Educational plans of World War II veterans. (Field Study No. 2). Leo T. Allbritten, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 73, Pub. No. 874, (C.S. 1946, Vol. VIII).

A comparison of selected Nebraska counties maintaining county high schools with those not maintaining county high schools (Field Study No. 1). Earl A. Arnold, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 144, Pub. No. 875, (C.S. 1946, Vol. VIII).

A study of the needs of freshmen home economics students and student personnel services in the School of Education of New York University. Zelpha Mae Bates, Ed.D. Thesis; New York University, 1946. pp. 261, Pub. No. 823, (M.A. 1946, Vol. VII, No. 1).

EDUCATION

Entomology in general education a determination of the principles of entomology of significance in general education. George Joseph Bergman, Ph.D. Thesis; New York University, 1946. pp. 263, Pub. No. 832, (M.A. 1947, Vol. VII, No. 2).

Utah--A Study of human resources (Field Study No. 1). LeRoy Bishop, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 238, Pub. No. 876, (C.S. 1946, Vol. VIII).

The relationship between college preparation and first year teaching experience of recent graduates of Western Michigan College, (Field Study No. 2.) Kenneth T. Bordine, Ed.D. Thesis; Colorado State College of Education, 1945. pp. 313, Pub. No. 774, (C.S. 1945, Vol. VII).

Reorganization of school administrative units and attendance areas in four Nebraska counties, (Field Study No. 2). Louis A. Bragg, Ed.D. Thesis; Colorado State College of Education, 1945. pp. 246, Pub. No. 775, (C.S. 1945, Vol. VII).

Determining the need for a Junior College (Field Study No. 1). Willis Maxson Chambers, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 160, Pub. No. 877, (C.S. 1946, Vol. VIII).

Community activities of negro rural teachers in Texas (Field Study No. 1). Oliver Wendell Crump, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 105, Pub. No. 885, (C.S. 1946, Vol. VIII).

A continuation of curriculum studies in the social sciences and citizenship; Part III, An evaluation of the social studies, (Field Study No. 3). Oscar A. DeLong, Ed.D. Thesis; Colorado State College of Education, 1945. pp. 165, Pub. No. 776, (C.S. 1945, Vol. VII).

An analytical study of methods of instruction at the command and general staff school. Orville L. Eaton, Ph.D. Thesis; University of Kansas, 1946. pp. 390, Pub. No. 886, (M.A. 1947, Vol. VII, No. 2).

EDUCATION

A study of the community of Wallingford, Connecticut with respect to secondary school curriculum and plant needs. Charles E. Elkema, Ed.D. Thesis; New York University, 1945. pp. 321, Pub. No. 770, (M.A. 1946, Vol. VII, No. 1).

The place of psychology in teacher education (Field Study No. 2). Alfred M. Ewing, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 124, Pub. No. 878, (C.S. 1946, Vol. VIII).

A high school aquatic program to meet wartime needs. William Edward Ferinden, Ed.D. Thesis; New York University, 1946. pp. 134, Pub. No. 839, (M.A. 1947, Vol. VII, No. 2).

A study in the understanding which fourth, fifth, and sixth grade pupils in the elementary school of Crawford, Nebraska, have for figures of speech which appear in the basic history textbook used in each of those grades (Field Study No. 1). Laurence S. Flaum, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 163, Pub. No. 879, (C.S. 1946, Vol. VIII).

The influence of college entrance requirements on the curriculum of Nebraska high schools (Field Study No. 2). Laurence S. Flaum, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 104, Pub. No. 880, (C.S. 1946, Vol. VIII).

A causal-comparative approach to the study of secondary education in Guatemala, Costa Rica, Ecuador and Colombia, 1924-1944. Herbert Bickling Gooden, Ed.D. Thesis; New York University, 1946. pp. 240, Pub. No. 824, (M.A. 1946, Vol. VII, No. 1).

A study of subject matter fields which occurred in the preparation of teachers graduated from Southwestern College in relation to the combinations of subject matter fields taught in the small high schools of Kansas (Field Study No. 1). Eleanor P. Hoag, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 211, Pub. No. 881, (C.S. 1946, Vol. VIII).

EDUCATION

The cost of assessing and collecting school taxes in three selected counties in Nebraska (Field Study No. 1). Barton L. Kline, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 116, Pub. No. 882, (C.S. 1946, Vol. VIII).

Determination of the effect of teaching literature with emphasis upon individual interpretation of figurative language. Theodora J. Koob, Ph.D. Thesis; New York University, 1946. pp. 371, Pub. No. 830, (M.A. 1947, Vol. VII, No. 2).

The Fort Collins school survey (Field Study No. 2). D. B. Leshner, Ed.D. Thesis; Colorado State College of Education, 1946. pp. 183, Pub. No. 883, (C.S. 1946, Vol. VIII).

A school plant program for the Tyrone public schools Tyrone, Pennsylvania. Norman Miller, Ed.D. Thesis; New York University, 1946, pp. 349, Pub. No. 838, (M.A. 1947, Vol. VII, No. 2).

Finger painting and personality diagnosis. Peter Joseph Napoli, Ed.D. Thesis; New York University, 1945. pp. 167, Pub. No. 801, (M.A. 1946, Vol. VII, No. 1).

A proposed course of study for physical education in elementary schools of Texas. Nina Lucille Norton, Ed.D. Thesis; New York University, 1946. pp. 332, Pub. No. 802, (M.A. 1946, Vol. VII, No. 1).

Relationship between speech education and student personnel services, (Field Study No. 2.) William Valentine O'Connell, Ed.D. Thesis; Colorado State College of Education, 1945. pp. 95, Pub. No. 777, (C.S. 1945, Vol. VII).

Education in Nigeria (1842-1942). Nnodu Joel Okongwu, Ph.D. Thesis; New York University, 1946. pp. 208, Pub. No. 822, (M.A. 1946, Vol. VII, No. 1).

Social guidance needs in the secondary negro schools, Cleveland County, North Carolina. Zelda Carpenter Pemberton, Ed.D. Thesis; New York University, 1946. pp. 120, Pub. No. 821, (M.A. 1946, Vol. VII, No. 1).

EDUCATION

The organization and administration of health, physical education, and recreation in the Atlanta University center. Juanita G. Pierce, Ed.D. Thesis; New York University, 1945. pp. 224, Pub. No. 803, (M.A. 1946, Vol. VII, No. 1).

The effectiveness of teaching business arithmetic as a separate subject and as an integrated part of Junior business training. William M. Polishhook, Ed.D. Thesis; New York University, 1945. pp. 199, Pub. No. 771, (M.A. 1946, Vol. VII, No. 1).

A critical analysis of the vocabulary of three standard series of pre-primers and primers in terms of how the words are used. Pauline Martz Rojas, Ph.D. Thesis; University of Michigan, 1946. pp. 285, Pub. No. 769, (M.A. 1946, Vol. VII, No. 1).

The pre-service preparation of elementary teachers at New York University. Clara Skiles-Platt, Ed.D. Thesis; New York University, 1946. pp. 159, Pub. No. 819, (M.A. 1946, Vol. VII, No. 1).

Democratic implications of realism in human dynamics and education. Adrian Tielman, Ph.D. Thesis; University of Kansas, 1945. pp. 191, Pub. No. 836, (M.A. 1947, Vol. VII, No. 2).

A comparative study of consolidation and non-consolidation of school districts in valley stream. Ellis F. White, Ed.D. Thesis; New York University, 1945. pp. 108, Pub. No. 772, (M.A. 1946, Vol. VII, No. 1).

A survey of the socio-economic status of transient and non-transient pupils on the elementary level, (Field Study No. 1.) Hendley Varner Williams, Jr., Ed.D. Thesis; Colorado State College of Education, 1943, pp. 140, Pub. No. 778, (C.S. 1945, Vol. VII).

Leisure activities of a selected sample of Spanish-American high school seniors (Field Study No. 2). Hendley V. Williams, Jr., Ed.D. Thesis; Colorado State College of Education, 1946. pp. 214, Pub. No. 884, (C.S. 1946, Vol. VIII).

EDUCATION

Basic music for the single curriculum. Prince Ahmed Williams, Ed.D. Thesis; New York University, 1946. pp. 110, Pub. No. 818, (M.A. 1946, Vol. VII, No. 1).

The State Department of Education in Missouri. Wallace Marvin Wilson, Ph.D. Thesis; University of Missouri, 1946. pp. 345, Pub. No. 827, (M.A. 1947, Vol. VII, No. 2).

EDUCATION AND PSYCHOLOGY

A psychometric study of non-intellectual factors in college achievement. Henry Borow, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 348, Pub. No. 788, (P.S. 1945, Vol. VIII).

The reading grade placement of the first twenty-three books awarded the John Newberry Prize. Leo R. Miller, Ed.D. Thesis; Pennsylvania State College, 1945. pp. 224, Pub. No. 789, (P.S. 1945, Vol. VIII).

Instructional units for professional courses in undergraduate industrial arts teacher education. G. Harold Silvius, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 486, Pub. No. 891, (P.S. 1946, Vol. IX).

An evaluation of a workshop program for in-service teacher education. S. June Smith, Ed.D. Thesis; Pennsylvania State College, 1945. pp. 119, Pub. No. 790, (P.S. 1945, Vol. VIII).

The law and education for minority groups in seventeen southern states. Harold Dodson Weaver, Ed.D. Thesis; Pennsylvania State College, 1945. pp. 187, Pub. No. 791, (P.S. 1945, Vol. VIII).

A comparison of college students classified by a psychological clinic as personality maladjustment cases and as vocational guidance cases. Roger Kenton Williams, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 155, Pub. No. 909, (P.S. 1946, Vol. IX).

EDUCATIONAL PSYCHOLOGY

Socio-psychological vectors in the behavior and attitudes of children. III. Teacher-pupil relationships.

EDUCATIONAL PSYCHOLOGY

Alice Marie Ewell, Ph.D. Thesis; Purdue University, 1942. pp. 212, Pub. No. 870, (M.A. 1947, Vol. VII, No. 2).

Screening the neuropsychiatrically unfit selectee from the armed forces. Arthur Weider, Ph.D. Thesis; New York University, 1945. pp. 84, Pub. No. 804, (M.A. 1946, Vol. VII, No. 1).

ENGINEERING

A photographic study of the influence of free convection currents near critical values of Reynolds number. William James Burich, Ph.D. Thesis; Purdue University, 1941. pp. 102, Pub. No. 865, (M.A. 1947, Vol. VII, No. 2).

A theoretical study of broad band radio frequency transformers. Samuel Gross Lutz, Ph.D. Thesis; Purdue University, 1938. pp. 391, Pub. No. 845, (M.A. 1947, Vol. VII, No. 2).

An analytic study of the charging characteristics of Marx surge generator circuits. Carl Sherwood Roys, Ph.D. Thesis; Purdue University, 1933. pp. 155, Pub. No. 857, (M.A. 1947, Vol. VII, No. 2).

FUEL TECHNOLOGY

Petrographic characteristics and plastic and carbonizing properties of Chilean coals. Americo Albala, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 287, Pub. No. 792, (P.S. 1945, Vol. VIII).

A partial study of the composition of a benzol still residue from light oil: The hydrocarbon fraction boiling in the range of 180° C. to 190° C. at 760 millimeters of mercury, absolute pressure. Robert Dale Hinkel, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 193, Pub. No. 910, (P.S. 1946, Vol. IX).

HOME ECONOMICS

The development of an accelerated laundering procedure for rayon fabrics. Pauline Evelyn Keeney, Ph.D.

HOME ECONOMICS

Thesis; Pennsylvania State College, 1946. pp. 313, Pub. No. 893, (P.S. 1946, Vol. IX).

A study of the effect of controlled exposure to light in the accelerated aging of rayon fabrics. Dorothy Siegert Lyle, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 520, Pub. No. 897, (P.S. 1946, Vol. IX).

LITERATURE, AMERICAN

Selected readings by negro authors for the young adolescent. Ruth Marie Thomas, Ed.D. Thesis; New York University, 1946. pp. 302, Pub. No. 820, (M.A. 1946, Vol. VII, No. 1).

LITERATURE, ENGLISH

Theory of the ode applied to the English ode before 1700. Isabel Broderick Rust, Ph.D. Thesis. University of Michigan, 1928. pp. 190, Pub. No. 805, (M.A. 1946, Vol. VII, No. 1).

Some chapters on Shakespearean criticism: Coleridge, Hazlitt, and Stoll. Yao Shen, Ed.D. Thesis; University of Michigan, 1944. pp. 306, Pub. No. 825, (M.A. 1947, Vol. VII, No. 2).

PETROLEUM AND NATURAL GAS

An investigation of the flow of homogeneous fluids through porous media. John C. Calhoun, Jr., Ph.D. Thesis; Pennsylvania State College, 1946. pp. 152, Pub. No. 905, (P.S. 1946, Vol. IX).

PHILOLOGY

A semantic study of cognates in Spanish and English. Edith J. Kendrick, Ph.D. Thesis; University of Illinois, 1943. pp. 270, Pub. No. 826, (M.A. 1947, Vol. VII, No. 2).

Finnish and Hungarian case systems: their form and function. Thomas Albert Sebeck, Ph.D. Thesis; Princeton University, 1945. pp. 67, Pub. No. 829, (M.A. 1947, Vol. VII, No. 2).

PHILOLOGY, ORIENTAL

The older inflected forms surviving in the modern Japanese written language. Joseph Koshimi Yamagiwa, Ph.D. Thesis; University of Michigan, 1942. pp. 467, Pub. No. 889, (M.A. 1947, Vol. VII, No. 2).

PHILOSOPHY

Jain cosmology as illustrated in the Samgrahanī Sūtra. Mary H. Shimer, Ph.D. Thesis; Bryn Mawr College, 1944. pp. 177, Pub. No. 811, (M.A. 1946, Vol. VII, No. 1).

Propaedeutic to value theory. James Ward Smith, Ph.D. Thesis; Princeton University, 1942. pp. 379, Pub. No. 810, (M.A. 1946, Vol. VII, No. 1).

PHYSICAL EDUCATION

Physical education in the elementary curricula of the Pennsylvania State Teachers Colleges. Maloise Sturdevant Dixon, Ed.D. Thesis; Pennsylvania State College, 1945. pp. 388, Pub. No. 793, (P.S. 1945, Vol. VIII).

PHYSICS

A magneto-optic effect in the X-ray region. Harold Thomas Clark, Ph.D. Thesis; Purdue University, 1936. pp. 70, Pub. No. 841, (M.A. 1947, Vol. VII, No. 2).

Artificial radioactivity in certain elements. Ray Lewis Doran, Ph.D. Thesis; Purdue University, 1941. pp. 111, Pub. No. 858, (M.A. 1947, Vol. VII, No. 2).

Heat transfer and vapour diffusion in the dehumidification of air. Walter Robertson Elliot, Ph.D. Thesis; Purdue University, 1941. pp. 146, Pub. No. 855, (M.A. 1947, Vol. VII, No. 2).

Disintegration by alpha-particles. John Ogden Hancock, Ph.D. Thesis; Purdue University, 1940. pp. 45, Pub. No. 873, (M.A. 1947, Vol. VII, No. 2).

A new type of Geiger counter. Thomas Gerald How, Ph.D. Thesis; Purdue University, 1938. pp. 84, Pub. No. 842, (M.A. 1947, Vol. VII, No. 2).

PHYSICS

X-ray scattering from liquids. Emery Parker Miller, Ph.D. Thesis; Purdue University, 1936. pp. 104, Pub. No. 871, (M.A. 1947, Vol. VII, No. 2).

The structure of amorphous and stretched rubber. Clarence Merton Parshall, Ph.D. Thesis; Purdue University, 1941. pp. 91, Pub. No. 864, (M.A. 1947, Vol. VII, No. 2).

A recording Raman spectrograph for the qualitative and quantitative analysis of hydrocarbons. Roy Vernon Wiegand, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 87, Pub. No. 908, (P.S. 1946, Vol. IX).

Pole figures of the effect of some cold rolling mill variables. John Karl Wood, Jr., Ph.D. Thesis; Pennsylvania State College, 1946. pp. 44, Pub. No. 907, (P.S. 1946, Vol. IX).

POLITICAL SCIENCE

Peter Norbeck: prairie statesman. Gilbert Courtland Fite, Ph.D. Thesis; University of Missouri, 1945. pp. 523, Pub. No. 828, (M.A. 1947, Vol. VII, No. 2).

Techniques of political persuasion used by certain congressmen from selected states, 1921-1946. Raymond Grann Lloyd, Ph.D. Thesis; New York University, 1946. pp. 429, Pub. No. 833, (M.A. 1947, Vol. VII, No. 2).

An inquiry into the passage of the Habeas Corpus Act of 1679. Helen Adams Nutting, Ph.D. Thesis; Bryn Mawr College, 1945. pp. 337, Pub. No. 816, (M.A. 1946, Vol. VII, No. 1).

PSYCHOLOGY

A comparative study between certain concepts and principles of modern psychology and the main writings of John Steinbeck. Eugene L. Freel, Ph.D. Thesis; New York University, 1946. pp. 127, Pub. No. 834, (M.A. 1947, Vol. VII, No. 2).

Existent statutory provisions for special education in the public schools of the United States in 1944.

PSYCHOLOGY

Agnes K. Garrity, Ed.D. Thesis; Pennsylvania State College, 1945. pp. 1002, Pub. No. 794, (P.S. 1945, Vol. VIII).

The construction and standardization of the Purdue mechanical assembly test. Maurice R. Graney, Ph.D. Thesis; Purdue University, 1942. pp. 115, Pub. No. 868, (M.A. 1947, Vol. VII, No. 2).

A study of the differentiating values of certain personality measures applied to a student and registered nurse population. Harold Curtis Reppert, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 83, Pub. No. 795, (P.S. 1945, Vol. VIII).

A study of the conditional type question. Douglas G. Schultz, Ph.D. Thesis; Pennsylvania State College, 1945. pp. 138, Pub. No. 796, (P.S. 1945, Vol. VIII).

Analysis of elemental motion time values in a simple assembly operation. Clifford E. Scott, Ph.D. Thesis; Purdue University, 1942. pp. 49, Pub. No. 860, (M.A. 1947, Vol. VII, No. 2).

PUBLIC HEALTH

A comparison of livebirths over 5½ pounds with livebirths 5½ pounds or less. F. Herbert Colwell, Dr. P. H. Thesis; University of Michigan, 1946. pp. 141, Pub. No. 812, (M.A. 1946, Vol. VII, No. 1).

SOCIOLOGY

Haiti et ses femmes--une etude d'evolution culturelle. Madeleine G. Sylvain Bouchereau, Ph.D. Thesis; Bryn Mawr College, 1941. pp. 349, Pub. No. 815, (M.A. 1946, Vol. VII, No. 1).

Youth in the Philadelphia labor market: a study of the vocational problems of young workers and related vocational services. Sophia T. Cambria, Ph.D. Thesis; Bryn Mawr College, 1945. pp. 308, Pub. No. 800, (M.A. 1946, Vol. VII, No. 1).

SOCIOLOGY

A comparative study of delinquent behavior manifestations in 100 delinquent and 100 non-delinquent negro boys. Mary Huff Diggs, Ph.D. Thesis; Bryn Mawr College, 1945. pp. 141, Pub. No. 814, (M.A. 1946, Vol. VII, No. 1).

The sociology of primitive religion. William J. Goode, Ph.D. Thesis; Pennsylvania State College, 1946. pp. 524, Pub. No. 890, (P.S. 1946, Vol. IX).

ZOOLOGY

Studies in the taxonomy, morphology, and life cycles of fish bladder flukes (Trematoda: Gorgoderidae) Edwin Benzel Steen, Ph.D. Thesis; Purdue University, 1938. pp. 100, Pub. No. 869, (M.A. 1947, Vol. VII, No. 2).